1999
Status & Condition
of the Arizona Highway System

Functional Classification • Levels of Development
Levels of Service • Present Serviceability Ratings
Bridge Sufficiency Ratings • Change in Conditions

ADOT

Arizona Department
of Transportation
Transportation Planning Division

ADOT

Arizona Department of Transportation

Transportation Planning Division

206 S. 17th Avenue Mail Drop 310B Phoenix, Arizona 85007.3212

Jane Dee Hull
Governor

Mary E. Peters
Director

Mary Lynn Tischer
Division Director

November, 1999

I am pleased to present the second annual Arizona Highway System Status and Condition Report. This report is intended to provide useful information about the condition of the State Highway System in a format that is readily accessible to transportation professionals and non-professionals. This report was produced by the Planning Team of the Transportation Planning Division (TPD). The maps contained in this report were developed through the team's Geographical Information System. There is a limited supply of hardcopies of this report, because we are producing this report in two other media. This report is available on CD-ROM and can also be viewed on our website. The TPD website is http://map.azfms.com. The statewide maps of Level of Service, Present Serviceabilty Rating, and Bridge Condition Rating are clickable. Just click on the area of interest and this information is displayed in more detail. To obtain this report on CD contact Lynn Sugiyama. Any comments, suggestions, or critiques should be directed to Joe Flaherty or Lynn Sugiyama of my staff. They can be contacted in the following ways:.

Joe Flaherty	Lynn Sugiyama
PH. 602-712-7172	PH. 602-712-6883
FAX 602-256-7563	FAX 602-256-7563
Email jflaherty@dot.state.az.us	Email lsugiyama@dot.state.az.us

Sincerely,

Mary Lynn Tischer, Director
Transportation Planning Division

TABLE OF CONTENTS

INTRODUCTION

FUNCTIONAL CLASSIFICATION

LEVEL OF DEVELOPMENT

LEVEL OF SERVICE

PRESENT SERVICEABILITY RATING

BRIDGE SUFFICIENCY RATING

CHANGE IN CONDITIONS

Introduction

The 1999 Arizona State Highway System Status and Condition Report is the second effort by the Arizona Department of Transportation's Transportation Planning Division to present information in a graphic format that is useful to both a professional and lay audience. In the past, reports of this type consisted of numerous tables, with a vast amount of numbers. They also consisted of graphs, charts and a few maps.

The Arizona state highway system route and lane mileage's are 6,619 and 17,370 respectively. This includes frontage roads. There are 3,945 bridges on the system. The data that is used to develop various performance measures are collected throughout the year and are stored in individual databases. These databases are integrated in the Highway Performance Monitoring System (HPMS) database. The HPMS database is then incorporated into the ADOT Geographical Information System (GIS).

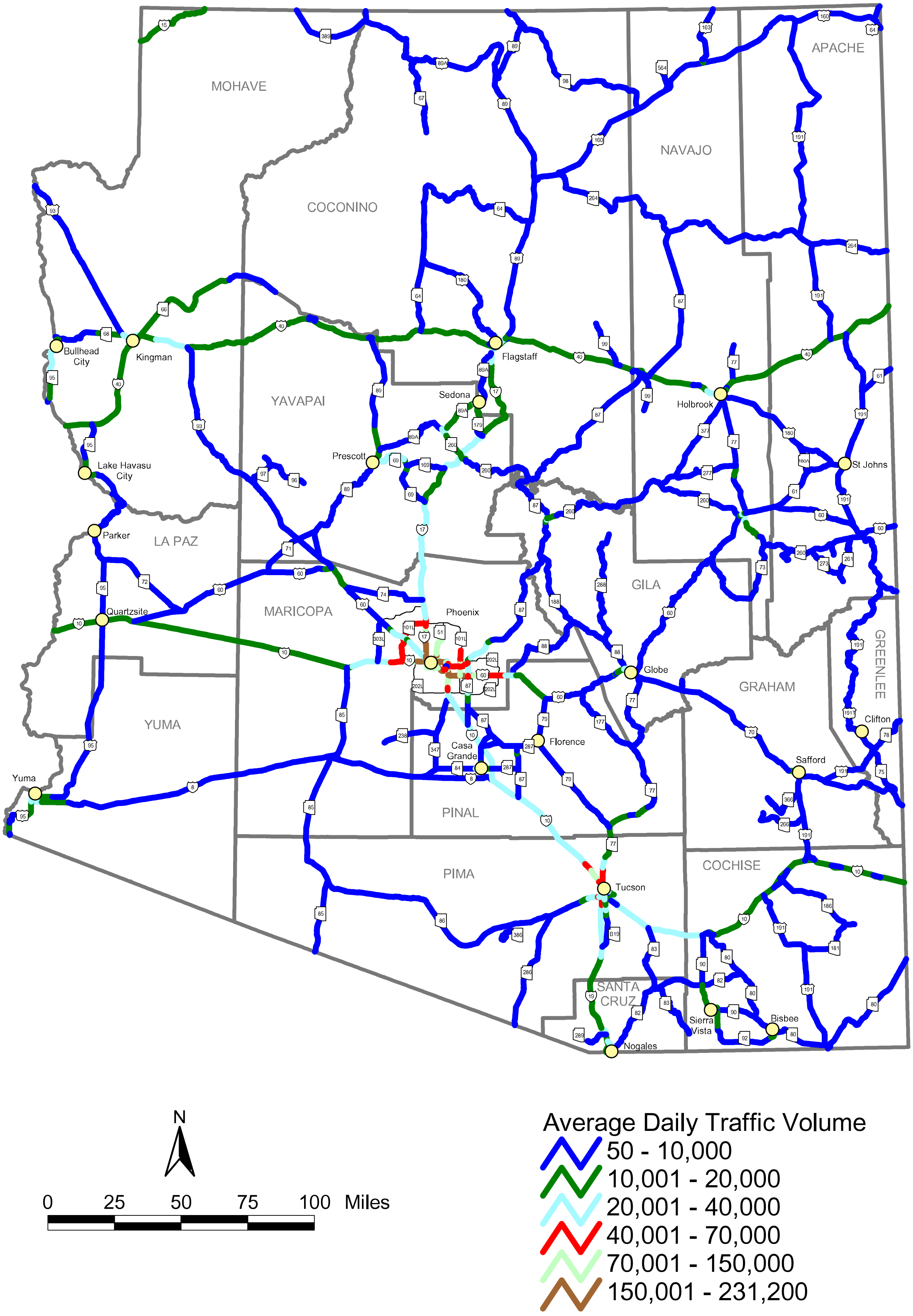
The GIS is a powerful tool that is used for analysis and mapping. The GIS was used for all the maps in this report with the exception of the Bicycle Suitability Map. Maps of the state highway system following this introduction show the 1997 Annual Average Daily Traffic (AADT) volumes and the percent of commercial vehicles in the traffic stream. Following these maps is the Bicycle Suitability Map and a brief overview of it's development

The data to develop the maps for Level Of Service (LOS), Present Serviceabilty Rating (PSR), and the Bridge Sufficiency Rating (BSR) was collected in 1997. It is the latest available. The functional classification of the state highway system was updated in 1997 as was the level of development.

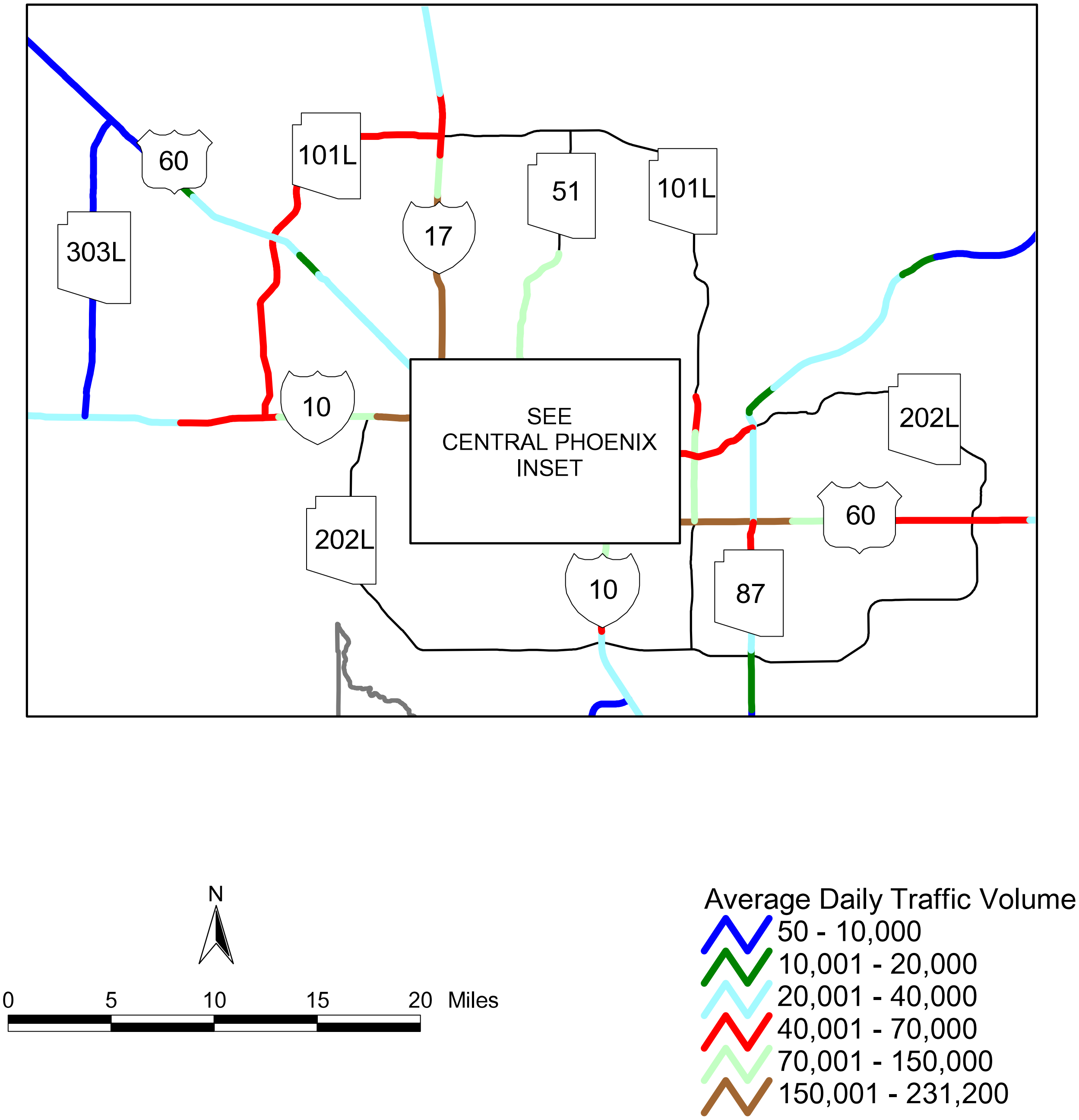
The Functional Classification and the Level Of Development (LOD) maps are presented at the state level with insets where appropriate. The LOS, PSR, and BSR maps are presented at the county level again, with insets where appropriate. A verbal description of the information being depicted precedes each set of maps.

As stated above this is the second effort to present this volume and type of information in a graphic format. It is the second edition of what is intended to be an annual report. We have included maps that show the changes in conditions from one year to the next.

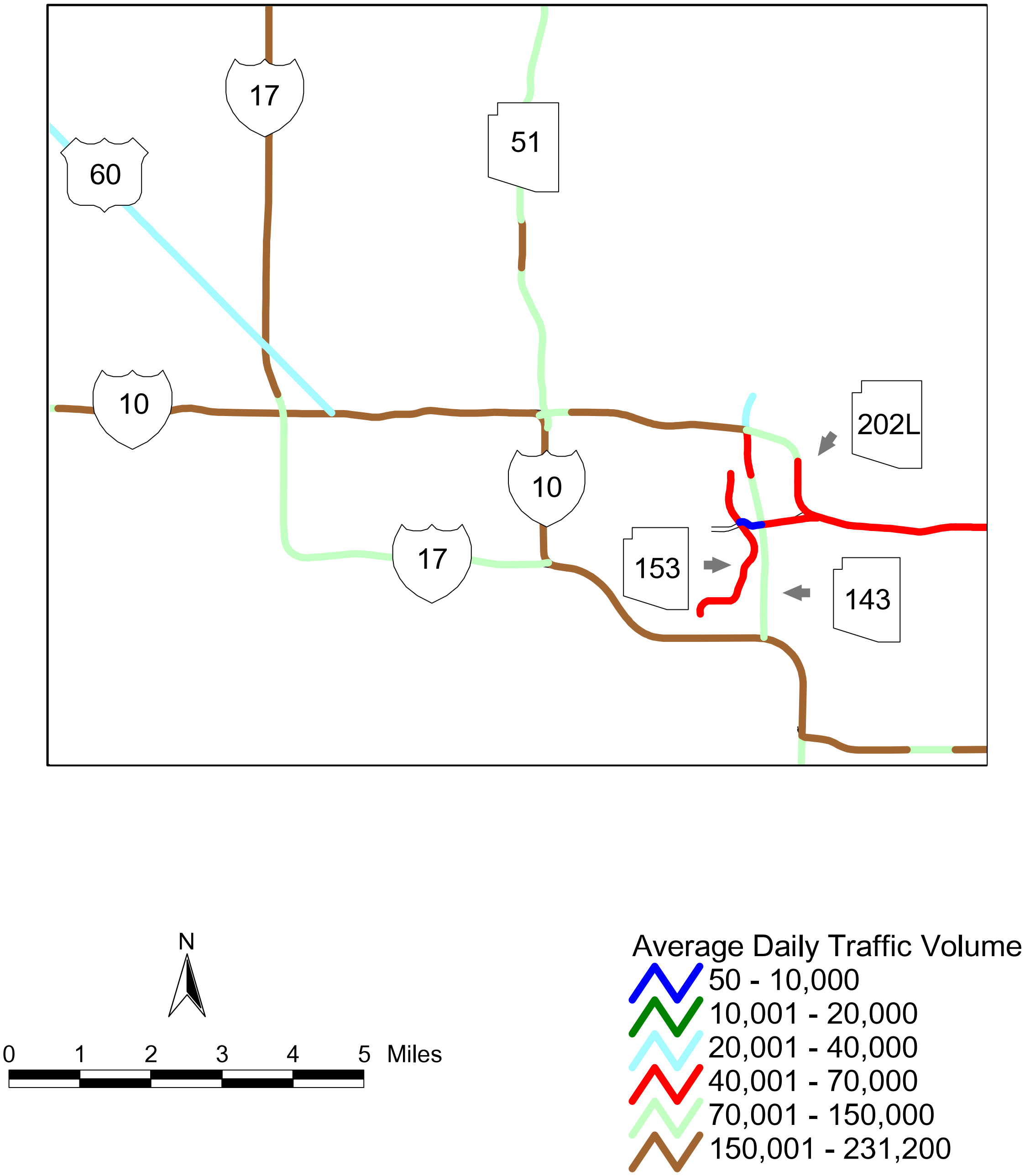
1997 AVERAGE DAILY TRAFFIC VOLUME
ON THE STATE HIGHWAY SYSTEM



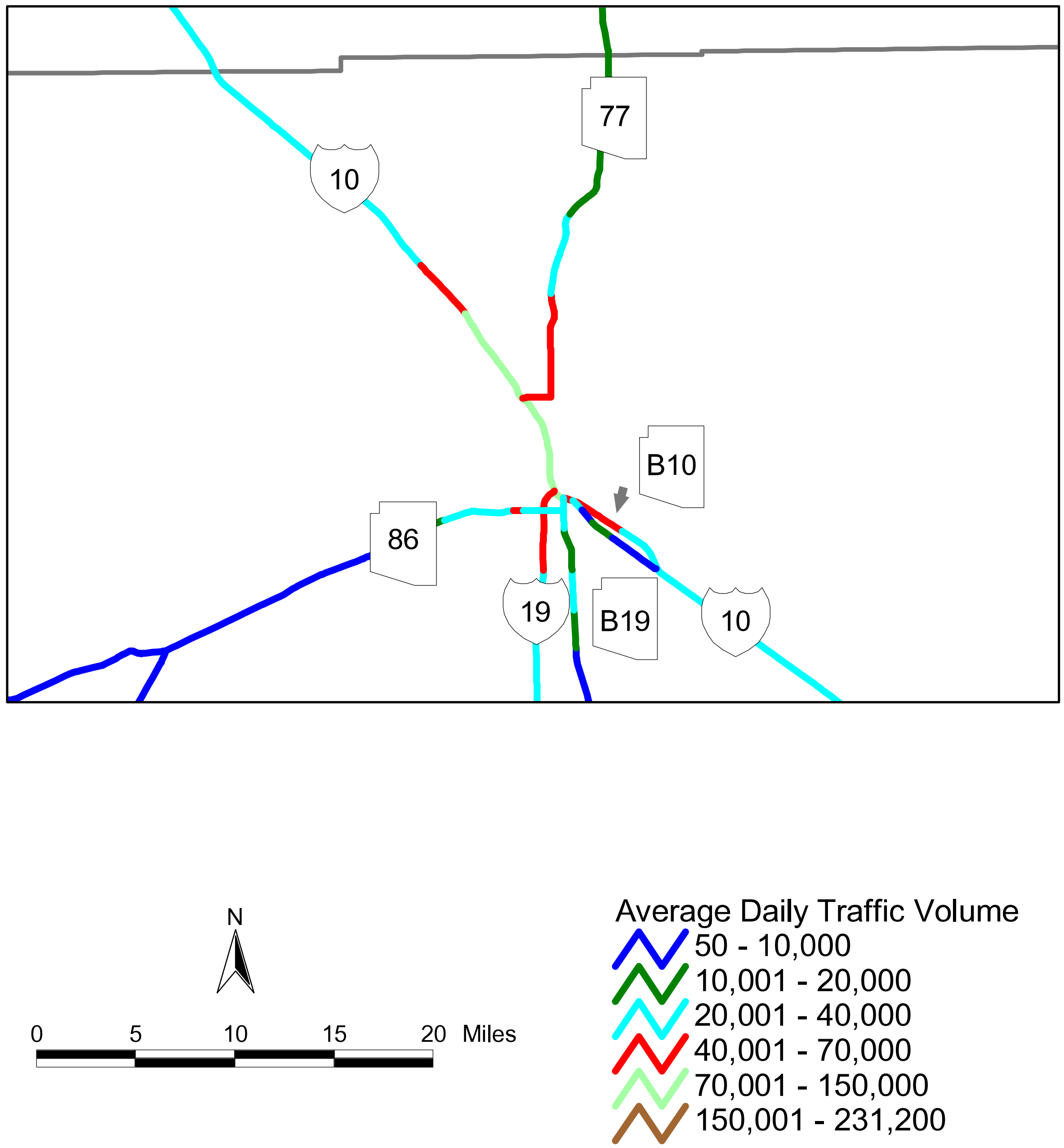
INSET
1997 AVERAGE DAILY TRAFFIC
IN THE PHOENIX METROPOLITAN AREA



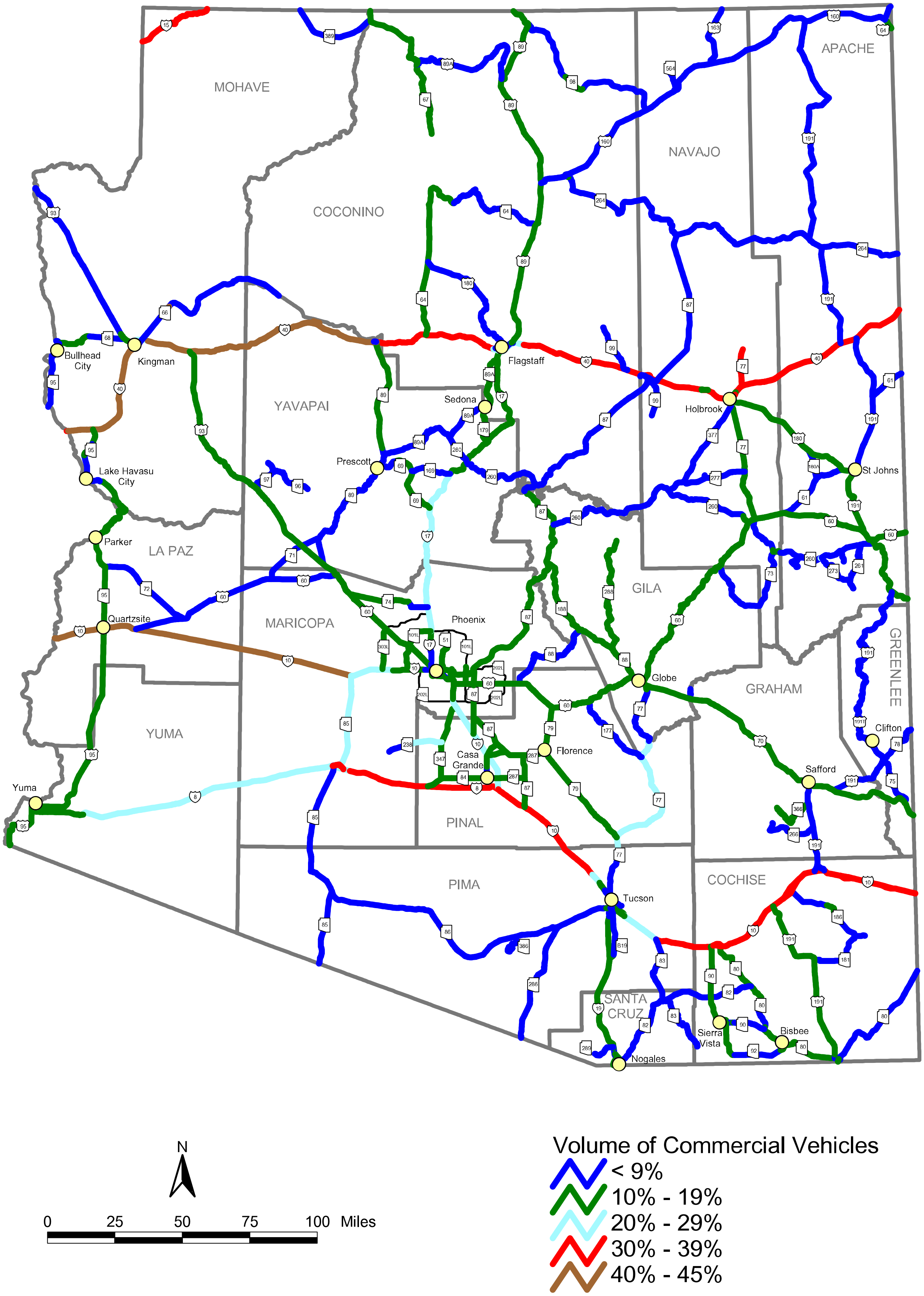
INSET
1997 AVERAGE DAILY TRAFFIC
IN CENTRAL PHOENIX



INSET
1997 AVERAGE DAILY TRAFFIC
IN THE TUCSON METROPOLITAN AREA



1997 PERCENTAGE OF COMMERCIAL VEHICLES ON THE STATE HIGHWAY SYSTEM

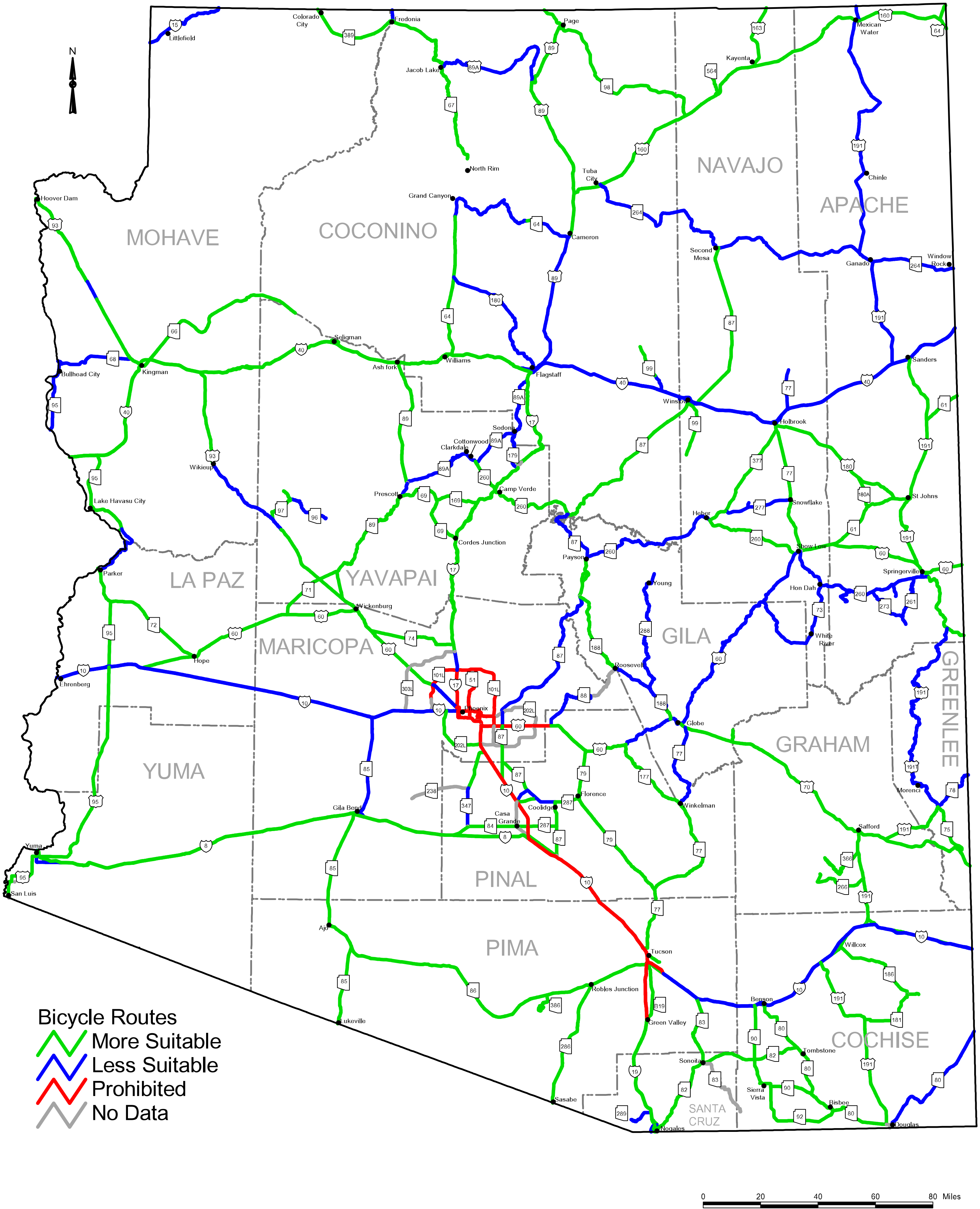


Bicycle Suitability

Bicycle suitability ratings of **more suitable** and **less suitable** have been assigned by the Governors Arizona Bicycle Task Force (GABTF) to all of the roads on the State Highway System where bicycling is allowed. Characteristics considered in developing these ratings were: 1) average number of vehicles per lane per day, 2) lane width including shoulder and 3) the percentage of truck traffic to total traffic volume. All three factors were weighted and lane width had twice the assigned value of the other two characteristics. Information regarding grade ascent has also been provided to bicyclists to identify steep inclines along routes as an aid in planning tours. The Arizona Bicycle Suitability Map developed by ADOT contains suitability ratings and gradient information of roadways on the State Highway System.

Approximately 47% of these routes have a suitability rating of more suitable. The map on the following page depicts the bicycle suitability ratings of the routes on the State Highway System.

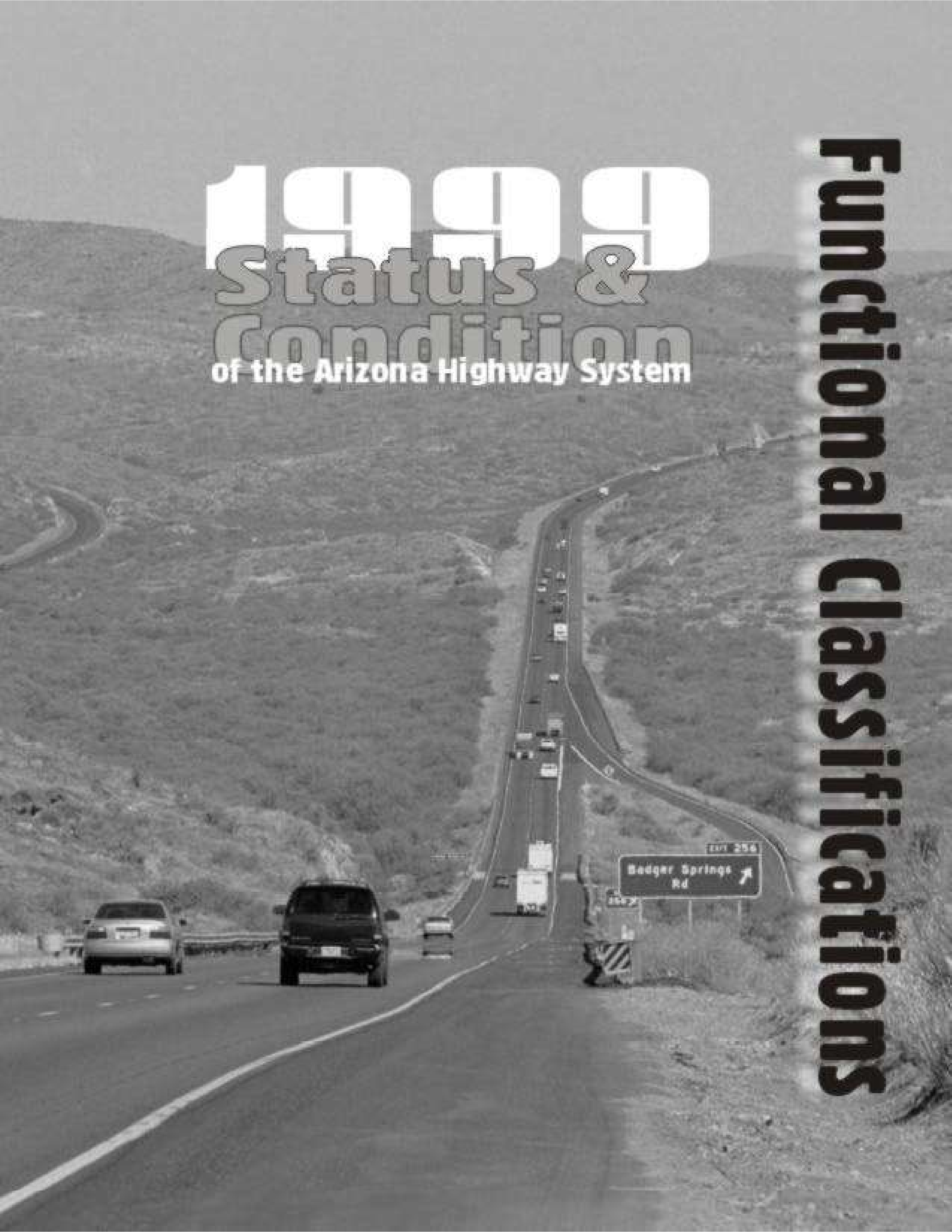
Map of Suitable Bicycle Routes on the State Highway System



Prepared by:
Arizona Dept of Transportation
Transportation Planning Group
tpd/jg \bikesuit.apr 11/96

1999
Status & Condition
of the Arizona Highway System

Functional Classifications



Functional Classification

The 1991 Intermodal Surface Transportation Efficiency Act (ISTEA) required each state to functionally reclassify its public roads and streets. The initial step in this process was to update the urban area boundaries by the middle of 1992. Extensive coordination and cooperation was essential throughout the updating of urban boundaries and the functional reclassification. ADOT worked with Colorado, New Mexico, Utah, and California to assure continuity of functional classification across state lines. The Phoenix, Tucson, and Yuma Metropolitan Planning Organizations (MPOs) were fully involved in this process. ADOT worked closely with the MPOs to ensure continuity at the urban boundaries and provide assistance as needed. The rural Councils Of Governments (COGs) were consulted to provide input on functional reclassification within their regions. ADOT and the COGs coordinated with the Native American Tribes to reclassify roads on their reservations. The Bureau of Indian affairs provided considerable assistance in this process. ADOT coordinated with the U.S. Forest Service and the National Park Service, including officials at regional offices and individual parks and forests. Close coordination with the Federal Highway Administration (FHWA) continued throughout the process. The functional reclassification of Arizona’s public roadways was completed in December 1992. Arizona’s submittal was reviewed and approved by the FHWA and the Secretary of Transportation and reported to Congress in 1993.

All roads that are part of the public road system are to be functionally classified as an integral system regardless of jurisdictional control of these roads. In other words, state highways, county roads, city streets, Forest Service roads, BIA roads, etc. are all part of the public road system. The classification process does not consider administrative or jurisdictional systems. The only way roads are separated into different classification systems is by their geographic location in rural, small urban, or urban areas.

The FHWA’s document titled ***Highway Functional Classification: Concepts, Criteria, and Procedures*** (revised March 1989) was the principal reference for reclassification. ADOT employed the procedures required in this document. While differences exist between the procedures for rural, small urban and urban area classification, all used a ‘top down’ approach. As generally depicted on the following page, this approach delineates the highest functionally classified roadways first and then works progressively down the hierarchy of functional systems to conclude with the classification of local roads and streets. ADOT started this ‘top down’ approach by identifying the most important internal and external traffic generators for Arizona. The procedure enabled ADOT to functionally classify the State Highway System and share that information to facilitate efforts by the MPOs and COGs. Arizona based the functional reclassification on current use, not projected use.

Due to the differences in the criteria used to functionally classify roads in rural, small urban, and urban areas it is simpler to categorize them as rural and urban for discussion purposes.

Rural Principal Arterials All rural interstate mileage is in this category. They are the principal corridors of interstate travel. There are relatively few corridors used by most travelers going to and from adjacent states or Mexico. Principal arterials serve the highest volume long distance trips. The non interstate routes identified as principal arterials serve the same basic purposes as the interstates, but at lower volumes and speeds.

Rural Minor Arterials These roads serve most of the larger communities not served by the principal arterial system. They provide interstate and intercounty service. The trip length and travel density is larger than on the collector systems. Travel is at relatively high speed with minimal interference to through movement.

Rural Major Collectors The travel on these roads is of intracounty and regional importance, rather than statewide importance. These roads provide service to any county seat not on an arterial road. They also serve larger communities not directly served by the higher systems. Rural major collectors usually connect to rural arterials.

Rural Minor Collectors These roads typically collect traffic from local roads and feed it onto major collectors or arterials. They tend to have lower traffic volumes then major collectors. If a minor collector carries a similar volume as a major collector trip distances are shorter. Also, they carry traffic on trips to less important traffic generators or they are parallel to a route of a higher classification.

Urban Principal Arterials There are three types of urban principal arterials: interstate, other freeways and expressways, and others with little or no access control. The primary function of these roads is to provide the greatest mobility for through movement, any direct access to adjacent land is purely incidental. This system serves the highest volume traffic generators and trips of longer length. They have a high proportion of urban area travel on a minimum of mileage.

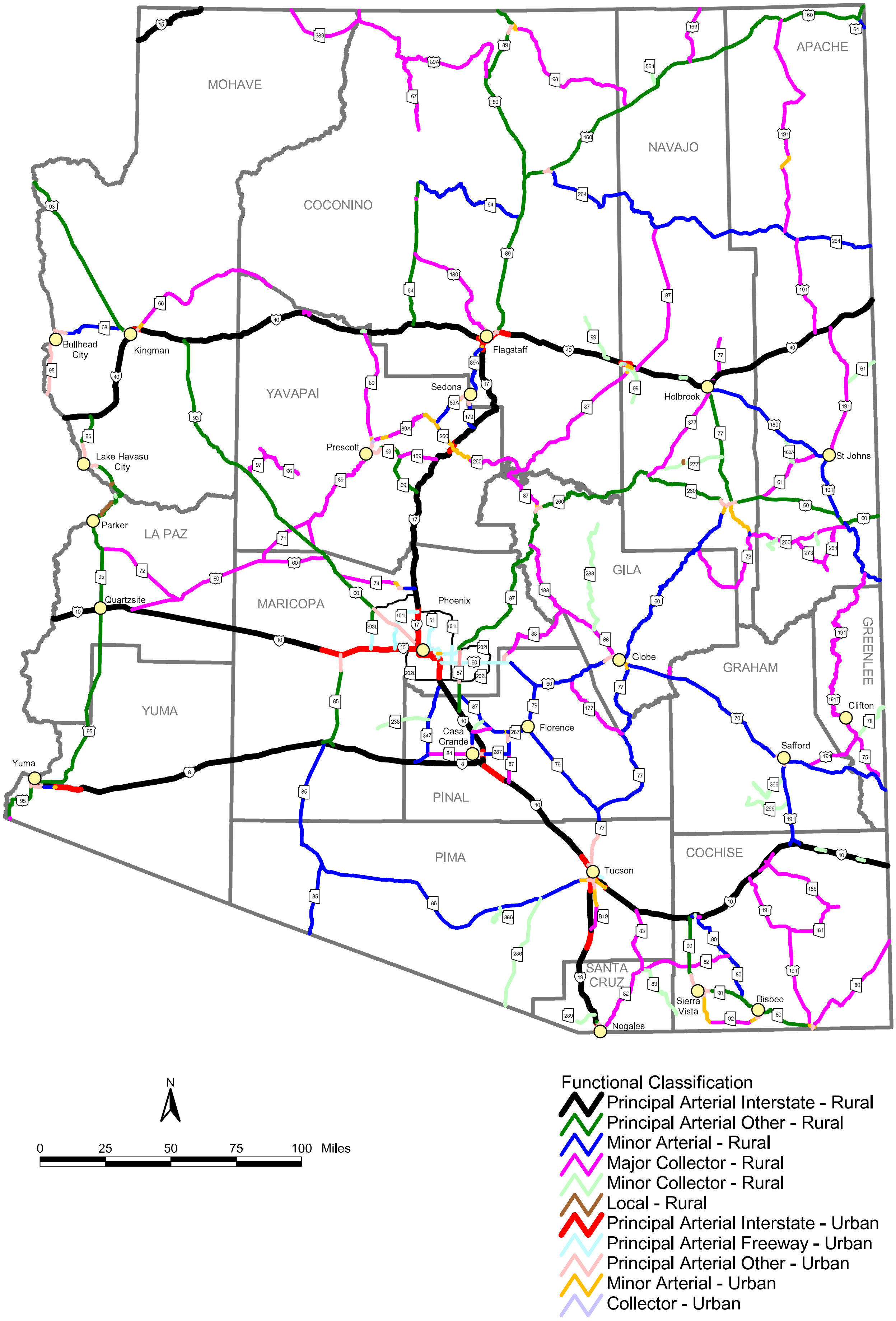
Urban Minor Arterials These roads provide trips of moderate length and trips of lower travel mobility than urban principal arterials. Consequently the speed limit is lower than on urban principal arterials.

Urban Collectors These roads distribute traffic from arterials and funnel traffic from local streets onto the arterial system. Frontage roads are classified independently of the controlled access facility they abut and are classified as collectors on the State Highway System.

Local Roads Local roads in both urban and rural areas are a residual. There are no roads on the State Highway System that are functionally classified as local roads.

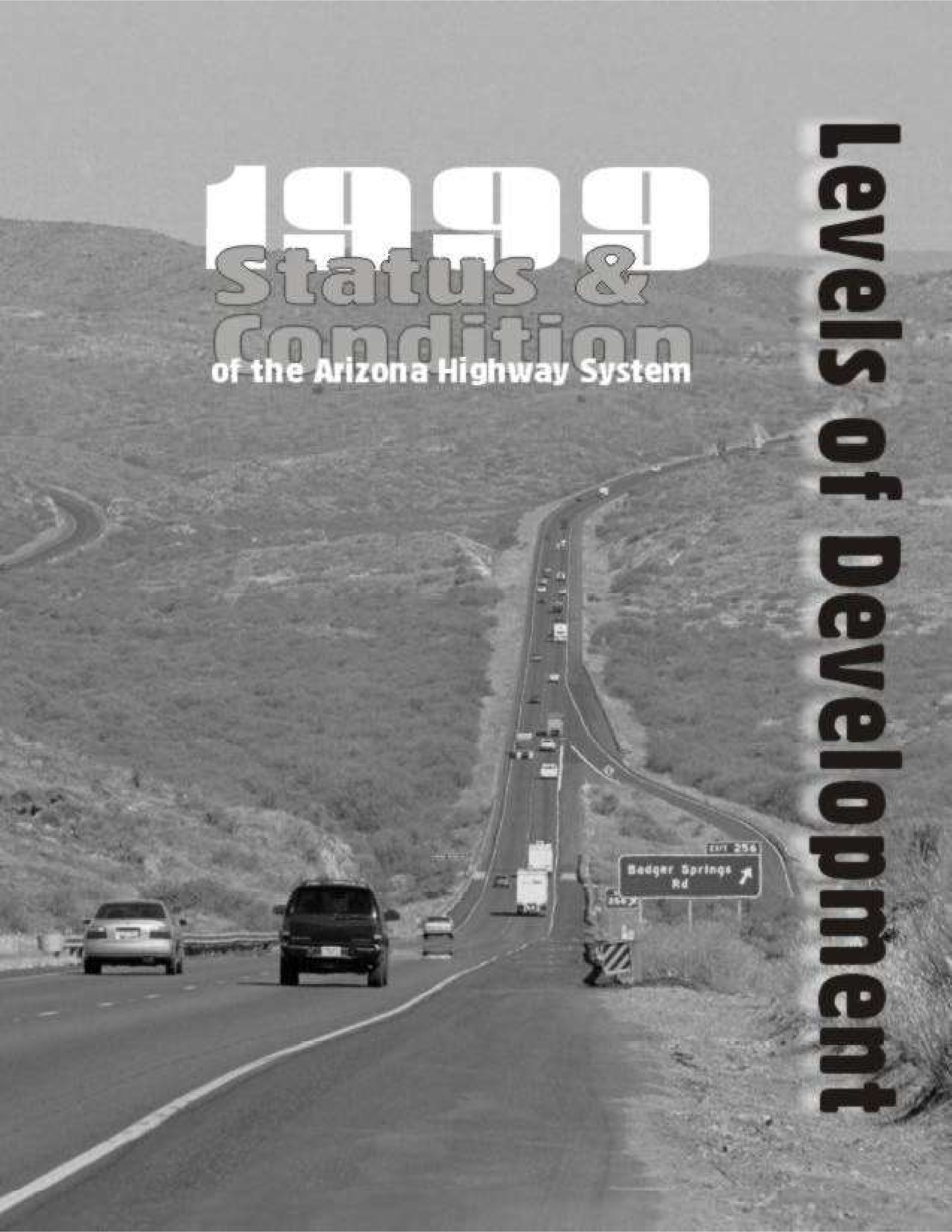
The following maps show the current FHWA approved functional classification of the State Highway System.

1998 FUNCTIONAL CLASSIFICATION OF THE STATE HIGHWAY SYSTEM



1999 Status & Condition
of the Arizona Highway System

Levels of Development



Level of Development

Central to the ADOT assessment of State Highway System needs is the notion of Level Of Development (LOD), a planning tool introduced as an integrative concept in the State Highway System Plan. LOD provides a hierarchical ordering of System routes into five categories in terms of the relative importance of routes to the System as a whole. The assignment to a LOD category takes into account the route’s functional classification, level of significance, current and future daily traffic, current and future truck traffic, and other unique route characteristics (e.g., recreational use). The LODs are described briefly below, followed by a description of the role that the LOD concept plays in the assessment of System needs.

Level of Development 1: Interstate and urban controlled access facilities form the backbone of the system. Among many functions served, LOD 1 routes provide the principal means of interstate travel, serve the greatest volume of traffic, link the state’s metropolitan areas, and provide the major truck routes. These routes are built and maintained to the highest standards.

Level of Development 2: In terms of both use and function, LOD 2 routes are the most important non-controlled access routes statewide. For the most part, these routes were constructed as two lane rural highways designed to accommodate relatively low traffic volumes. With continuing growth, new demands are being placed on these highways to accommodate increased automobile and truck traffic. Hence, these routes are prime candidates for major reconstruction projects to provide the additional capacity to maintain both highway safety and performance.

Level of Development 3: Routes without unique travel or service characteristics comprise the LOD 3 category. These are mainly two lane rural routes, which may be expanded to four lanes in urban areas. Most of the routes on the System are in this category.

Level of Development 4: Highways bearing low traffic volumes and serving primarily as feeder routes with local significance compose the LOD 4 category.

Level of Development 5: The last category in the hierarchy is comprised of routes which no longer serve a state level service role, together with routes that have never been built. Thus, LOD 5 routes are prime candidates to transfer from the state system.

The following maps depict all state highways and the LOD to which they have been assigned. Note that over 90% of the total mileage is in rural areas, and that the LOD 2 network is much smaller than either the LOD 1 or 3 systems. It is apparent that LOD 3 routes comprise by far the largest category, especially on the rural system.

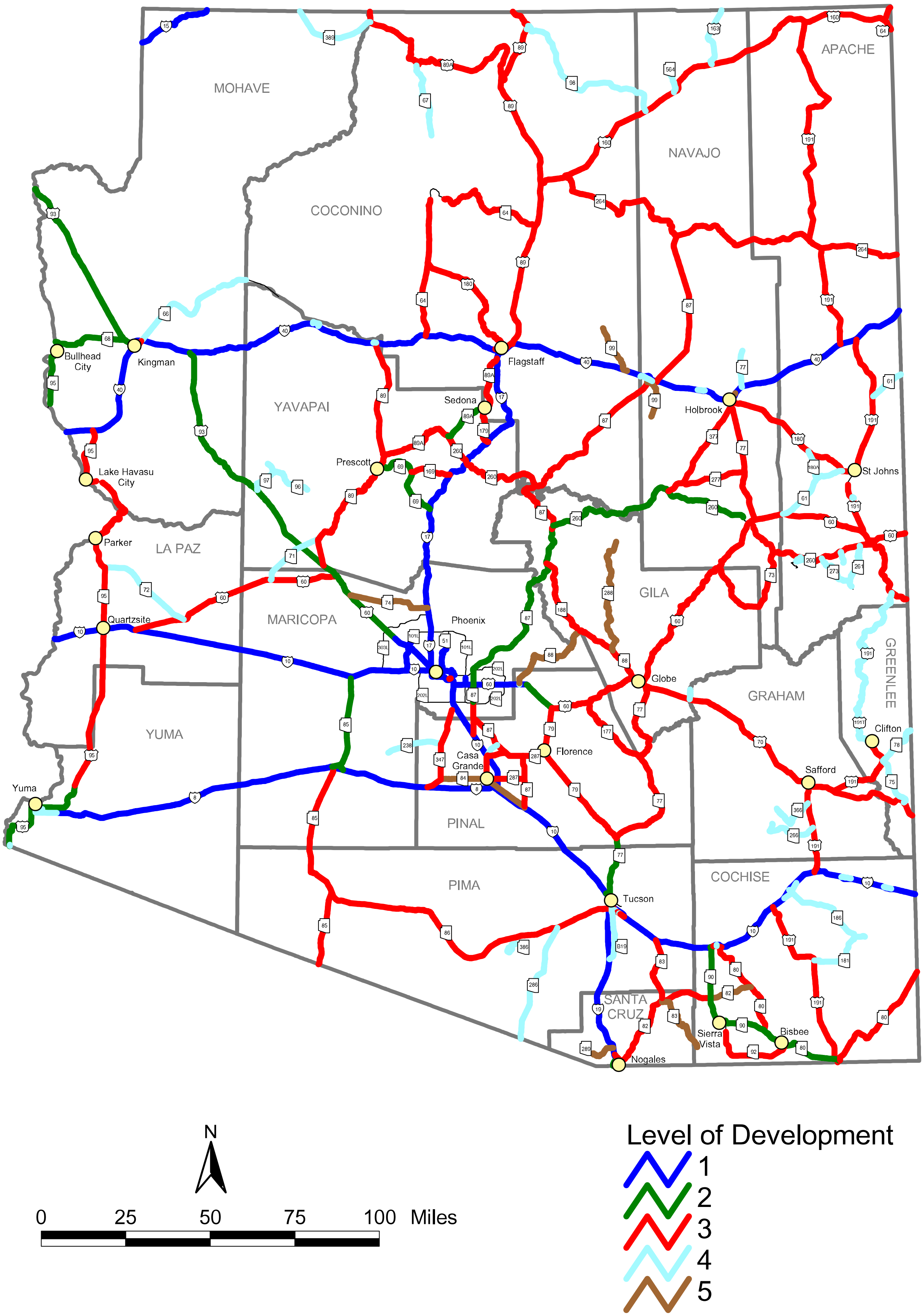
Stability of Route Assignments to Levels of Development

Because the assignment of a highway to a particular LOD is based on a set of standards, a highway may be reassigned to another LOD when the function or use of that highway changes. However, given the nature of the standards and current projections of population growth and travel in Arizona, such changes are likely to occur infrequently. It was assumed that the functions served by individual routes would not change sufficiently in the coming decade to warrant reassignment to another LOD.

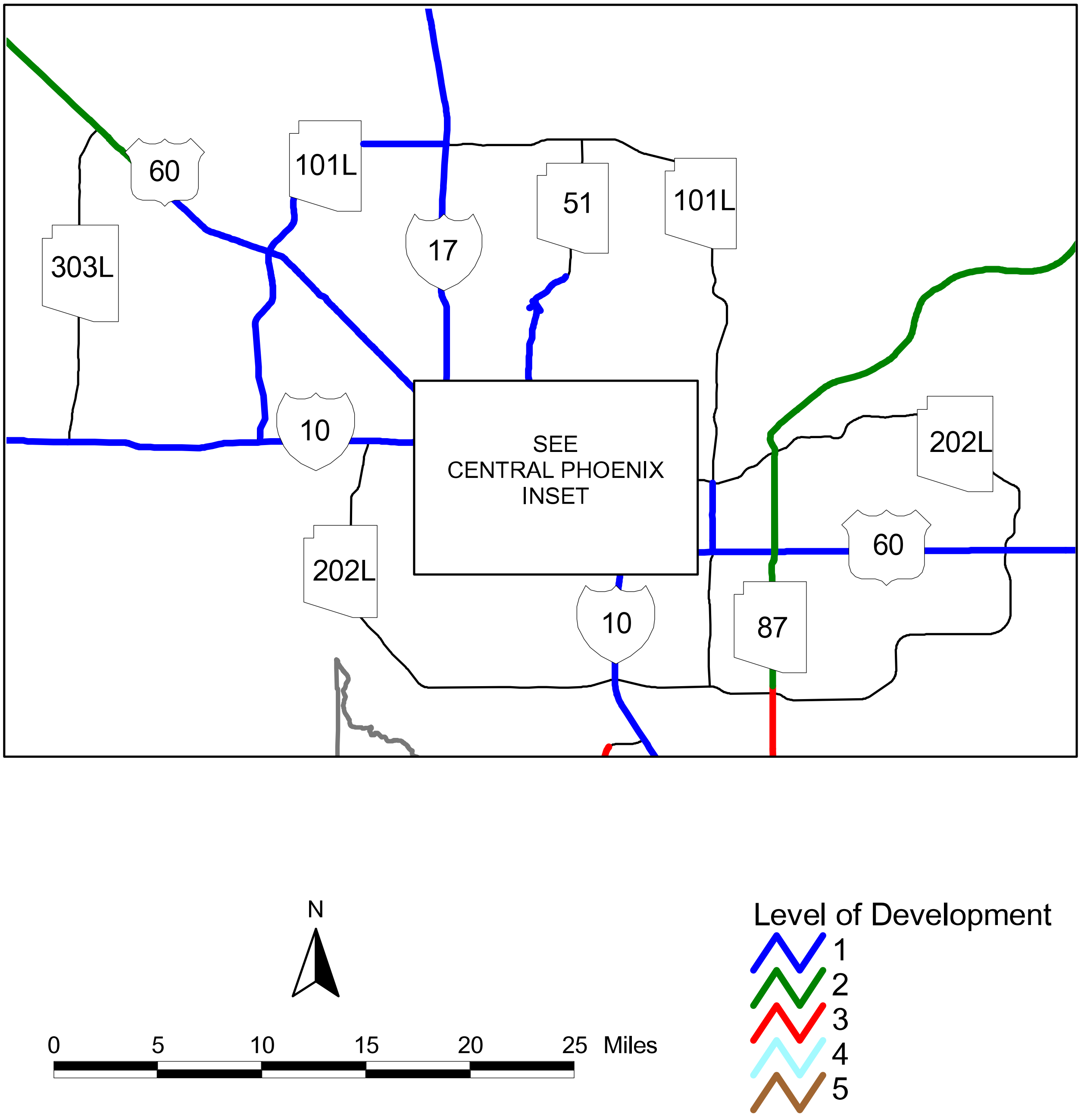
Value of the Level of Development Concept

Much of the utility of the LOD concept lies in making explicit important differences among system components. The hierarchy of routes points out the fact the System is not homogeneous; rather it is comprised of interrelated parts which vary considerably in terms of functions served. LOD, then, may be viewed as a categorical system, which summarizes certain critical differences among routes. Differences which have implications for a variety of administrative, operational, and investment decisions. For example, recognition of such differences is important in defining appropriate construction or reconstruction projects. It is important in establishing priorities among routes competing for limited funds.

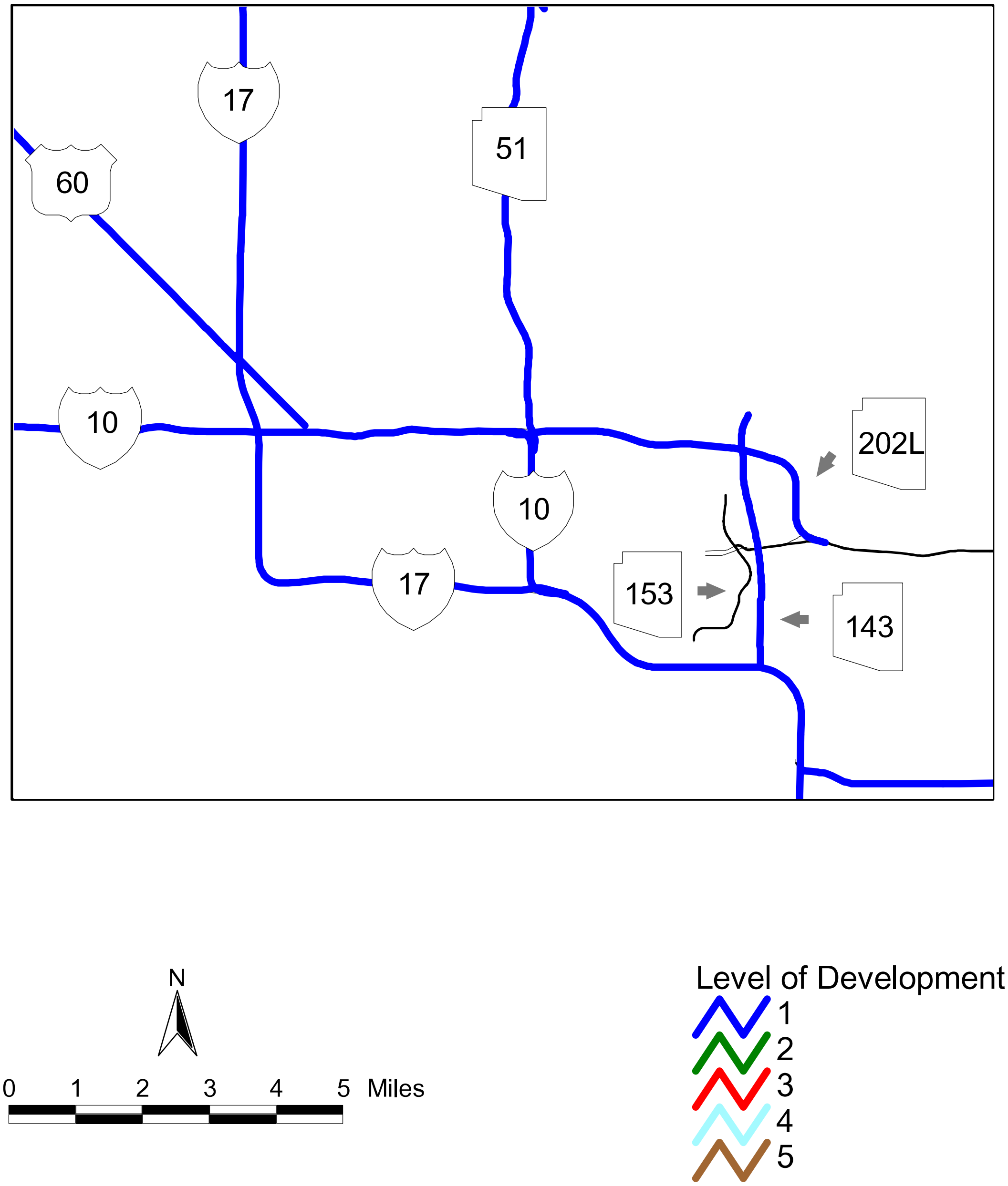
THE LEVEL OF DEVELOPMENT
ON THE STATE HIGHWAY SYSTEM



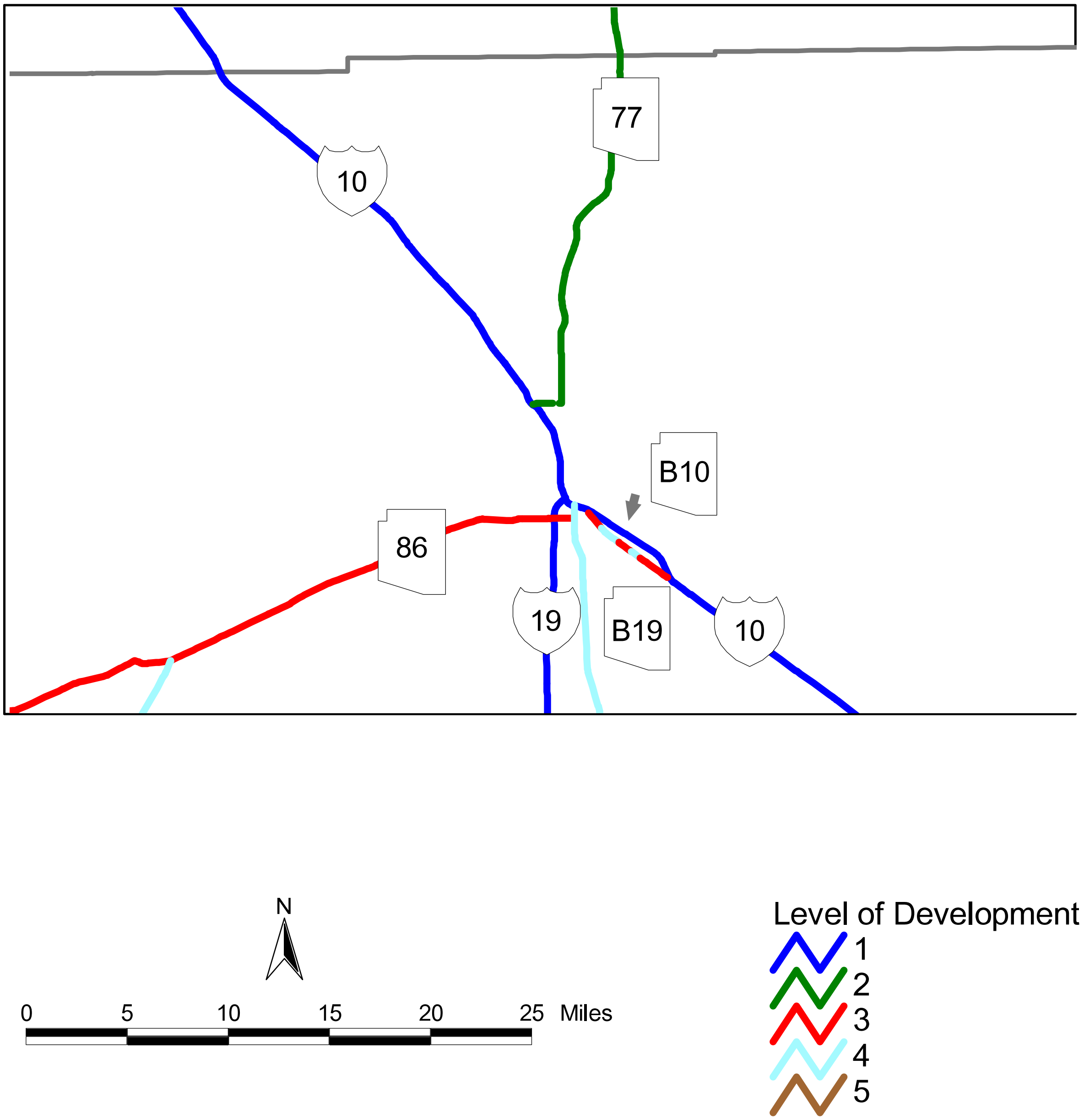
INSET
LEVEL OF DEVELOPMENT IN THE PHOENIX METROPOLITAN AREA



INSET
LEVEL OF DEVELOPMENT IN CENTRAL PHOENIX



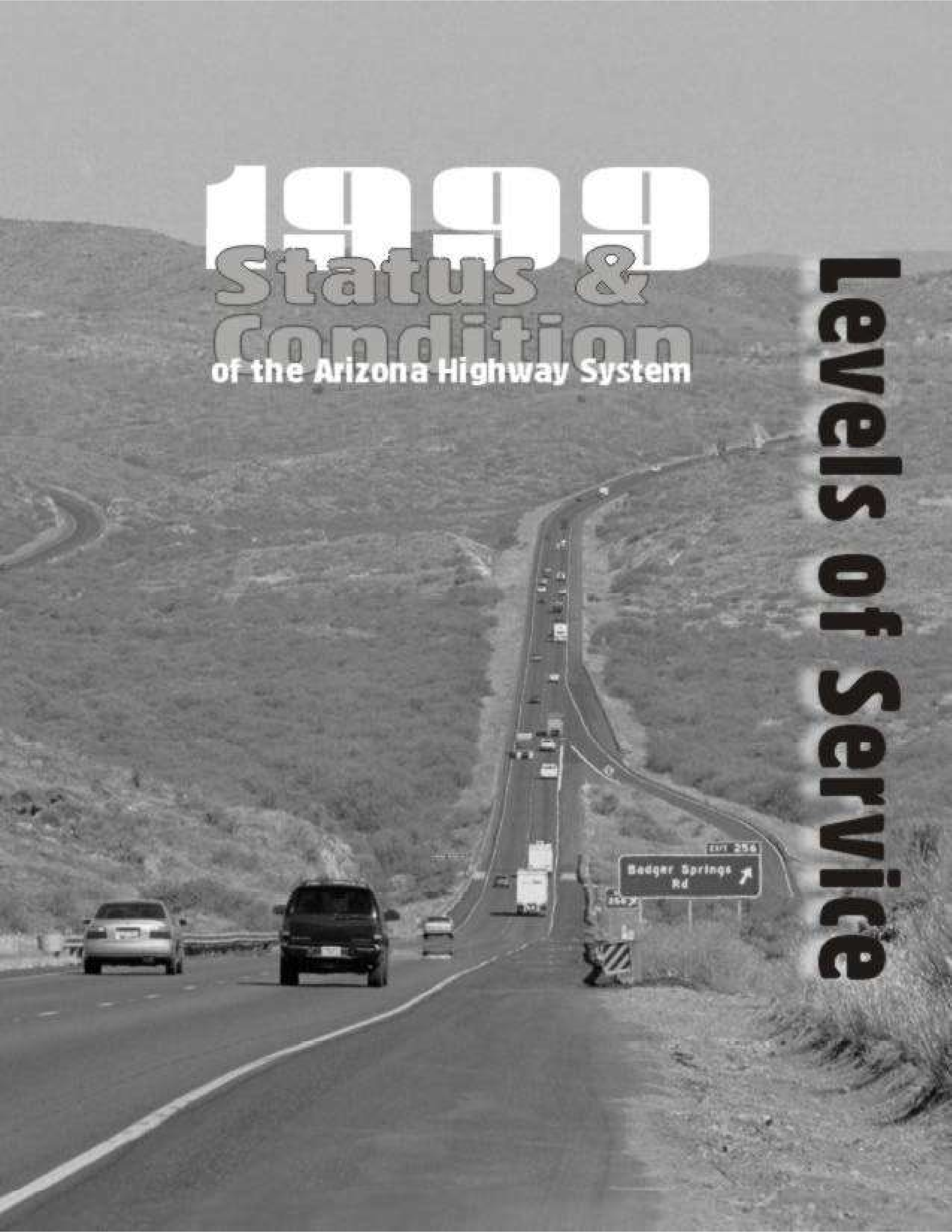
INSET
LEVEL OF DEVELOPMENT IN THE TUCSON METROPOLITAN AREA



1999 Status & Condition

of the Arizona Highway System

Levels of Service



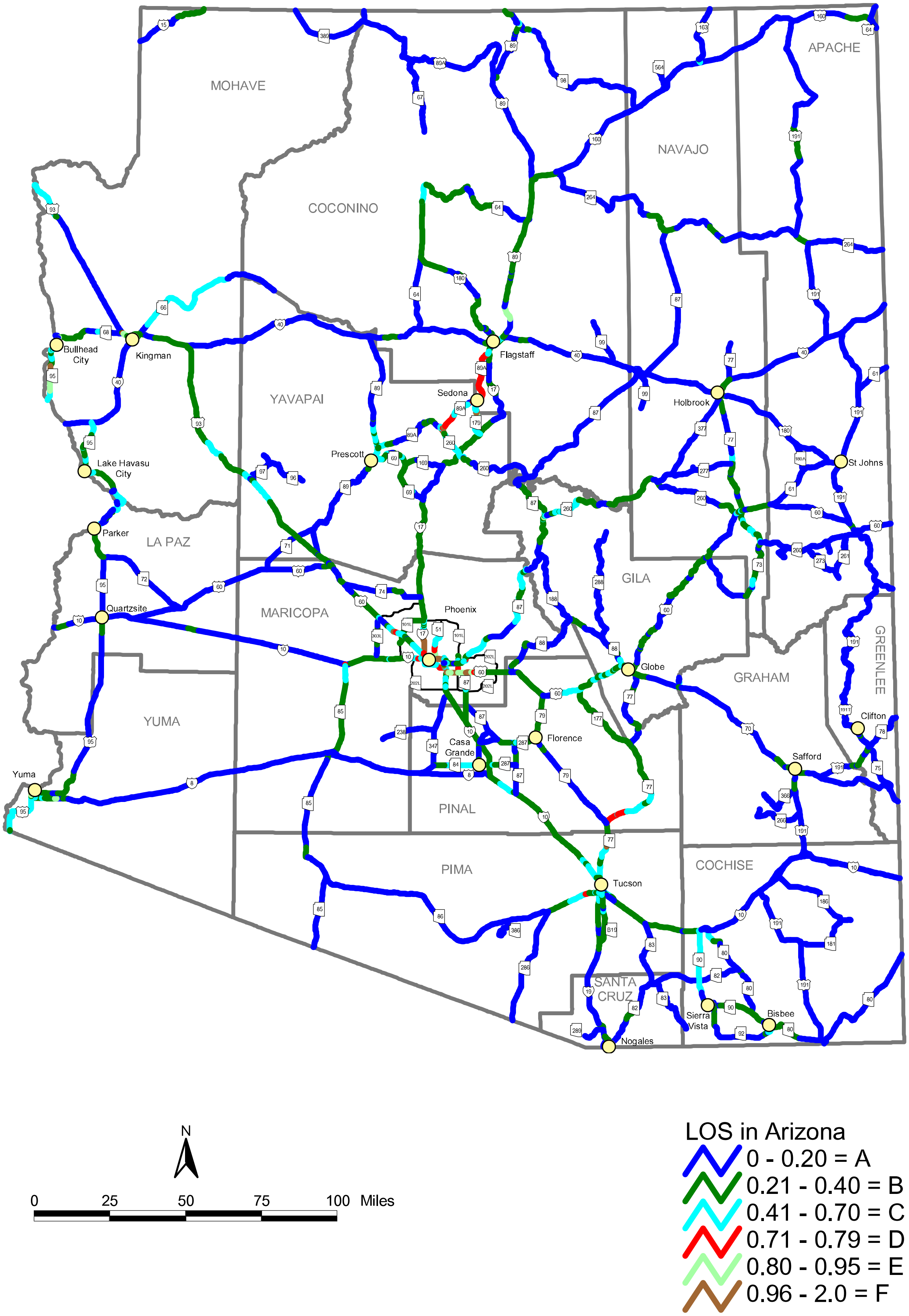
Level of Service

The Level Of Service (LOS) is derived from the range of values of the volume/ capacity ratio (v/c). The v/c ratio is the ratio of demand flow rate (volume) to capacity for a traffic facility. The volume is the number of vehicles passing a point on a lane, roadway, or other trafficway during some time interval expressed in vehicles. The time interval used in developing the v/c ratios used in this report is equal to a day. The vehicles are expressed in Annual Average Daily Traffic (AADT). The capacity is the maximum rate of flow at which vehicles can reasonably be expected to traverse a point or uniform segment of a lane or roadway during a specified time period under prevailing roadway, traffic, and control conditions. Capacity is also expressed as AADT. The LOS is a qualitative measure describing operational conditions within a traffic stream generally described in terms of such factors as speed and travel time, freedom to maneuver, traffic interruptions, comfort and convenience, and safety. The v/c ratios, the LOS and the the conditions they indicate are as follows:

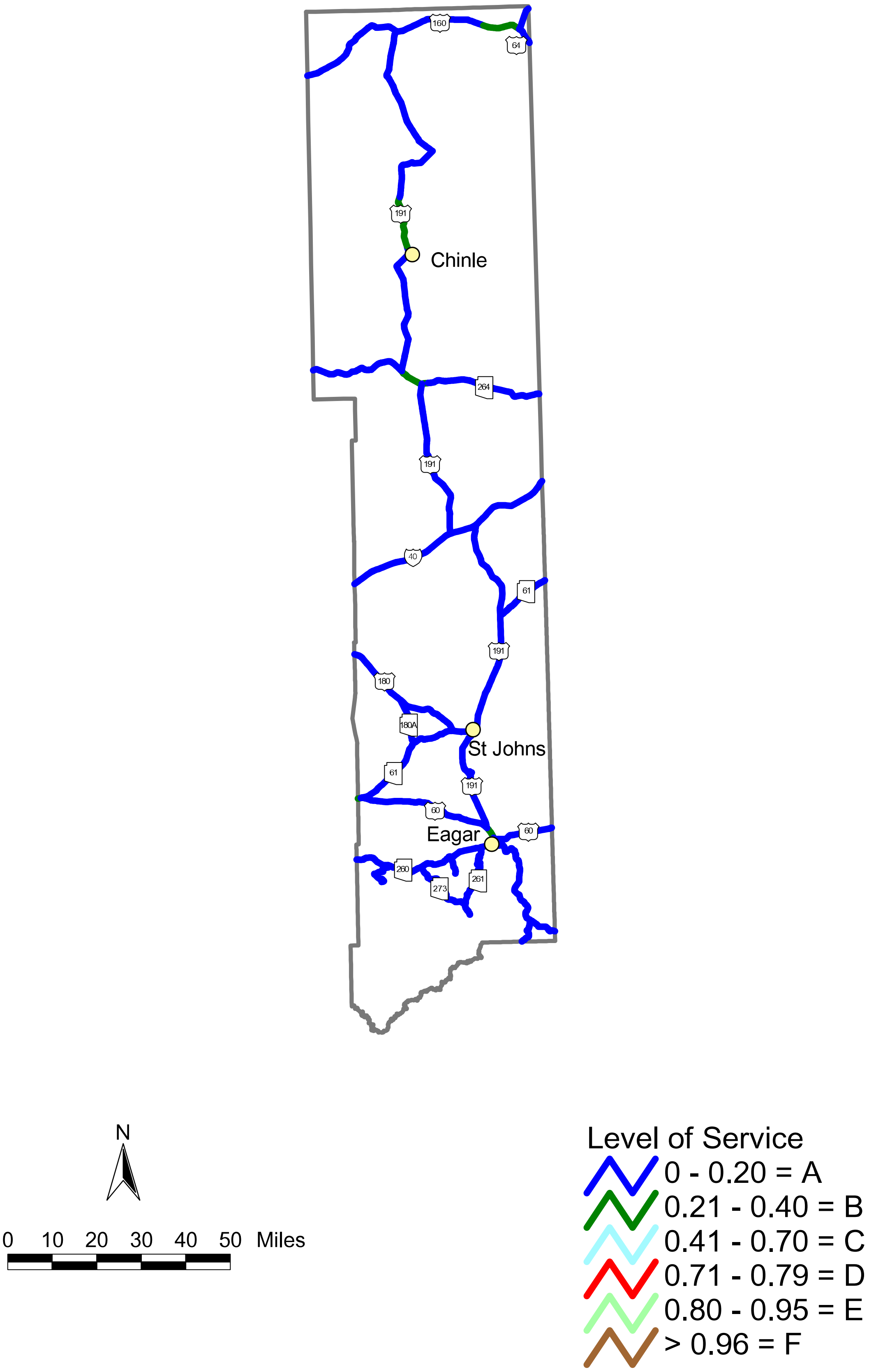
V/C Ratio	LOS	Condition
0 - 0.20	A	Free flow
0.21 - 0.40	B	Free Flow with maneuverability slightly impeded
0.41 - 0.70	C	Stable flow maneuverabilty noticeably restricted
0.71 - 0.79	D	Stable flow, reduced speed maneuverabilty limited
0.80 - 0.95	E	Near capacity, speeds are low but relatively uniform
>0.96	F	Volume at or near capacity, speeds are significantly reduced.

The LOS data is mapped at the county level and inserts are used where appropriate.

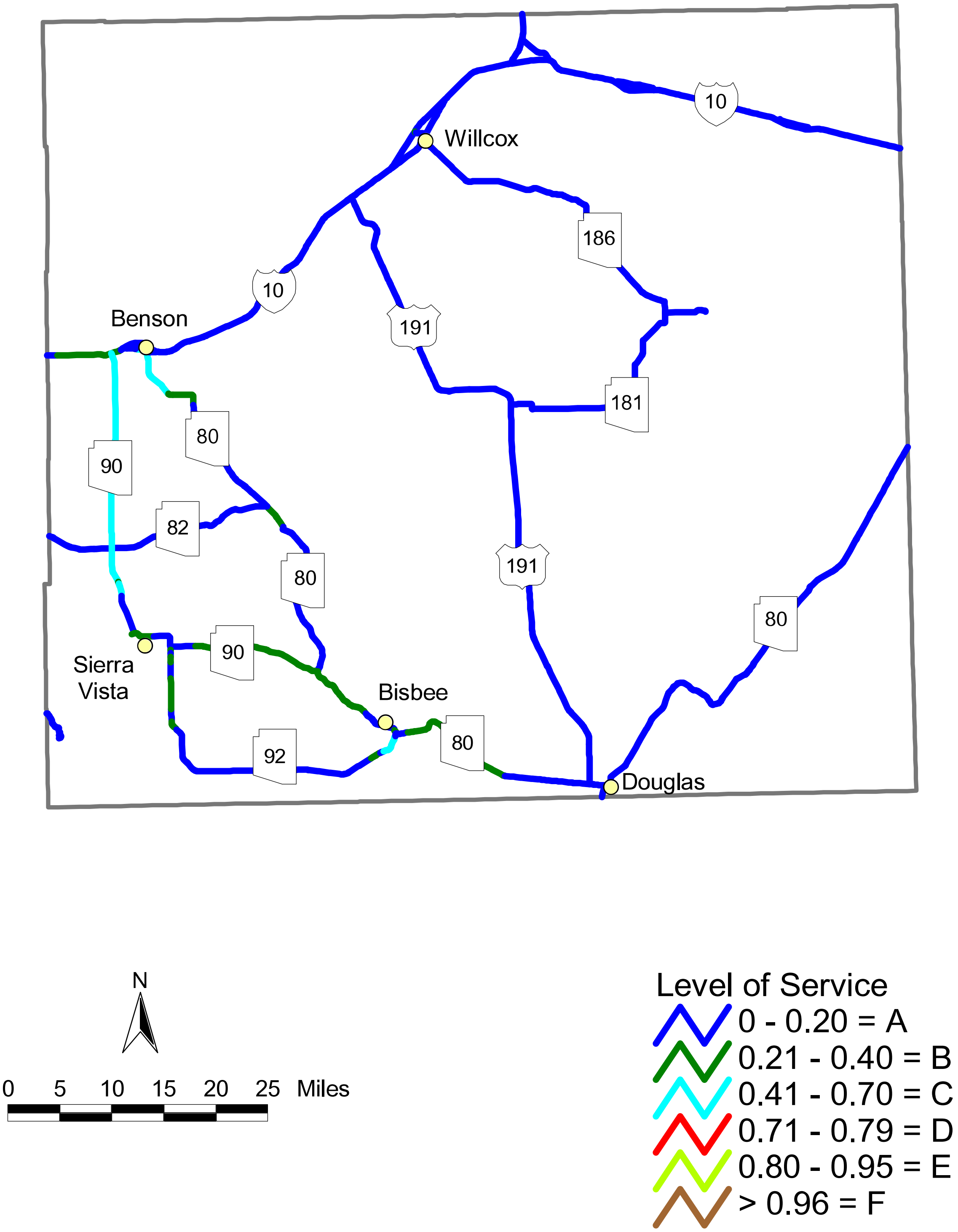
1999 LEVEL OF SERVICE ON THE ARIZONA STATE HIGHWAY SYSTEM



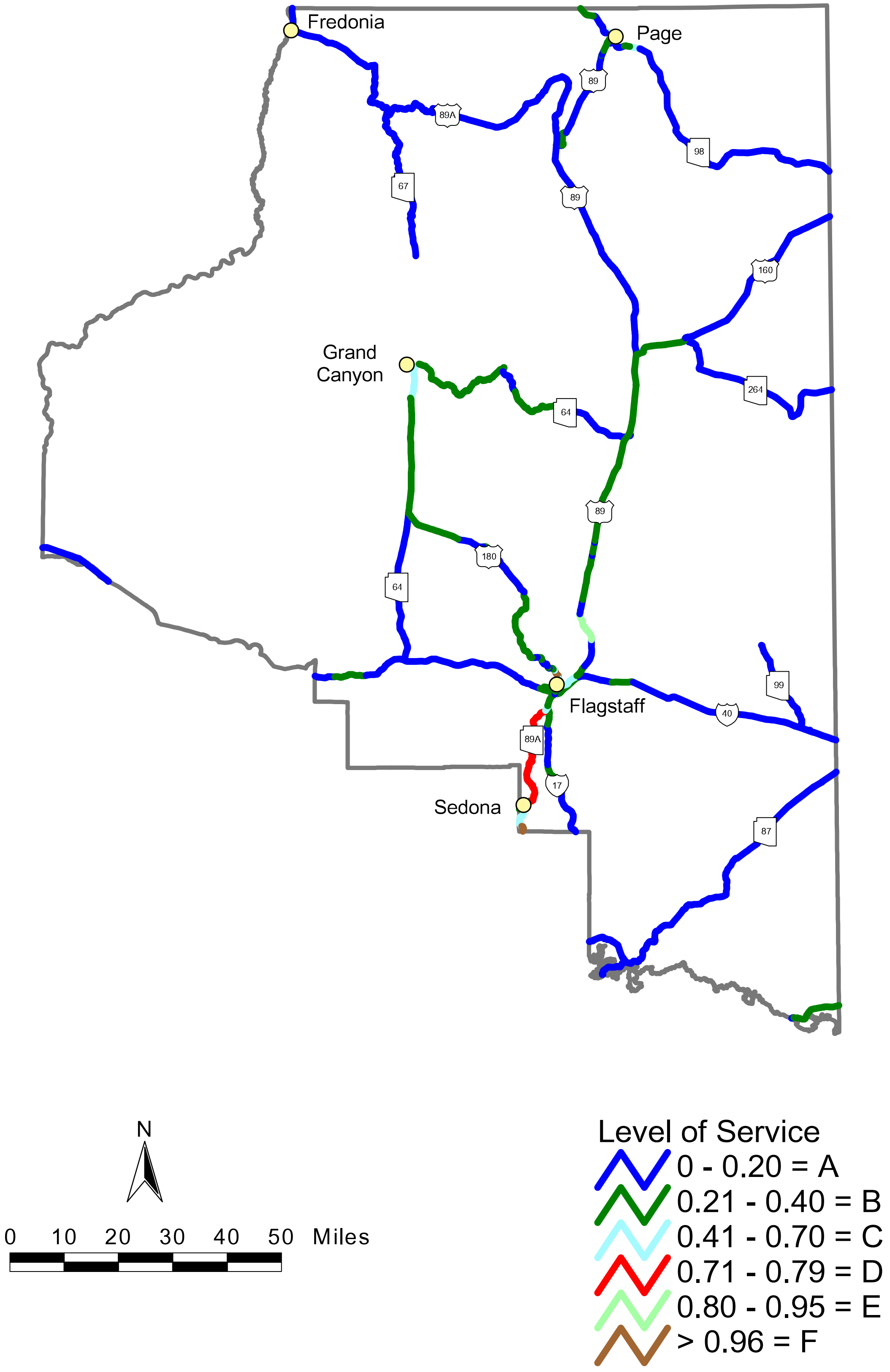
LEVEL OF SERVICE IN APACHE COUNTY



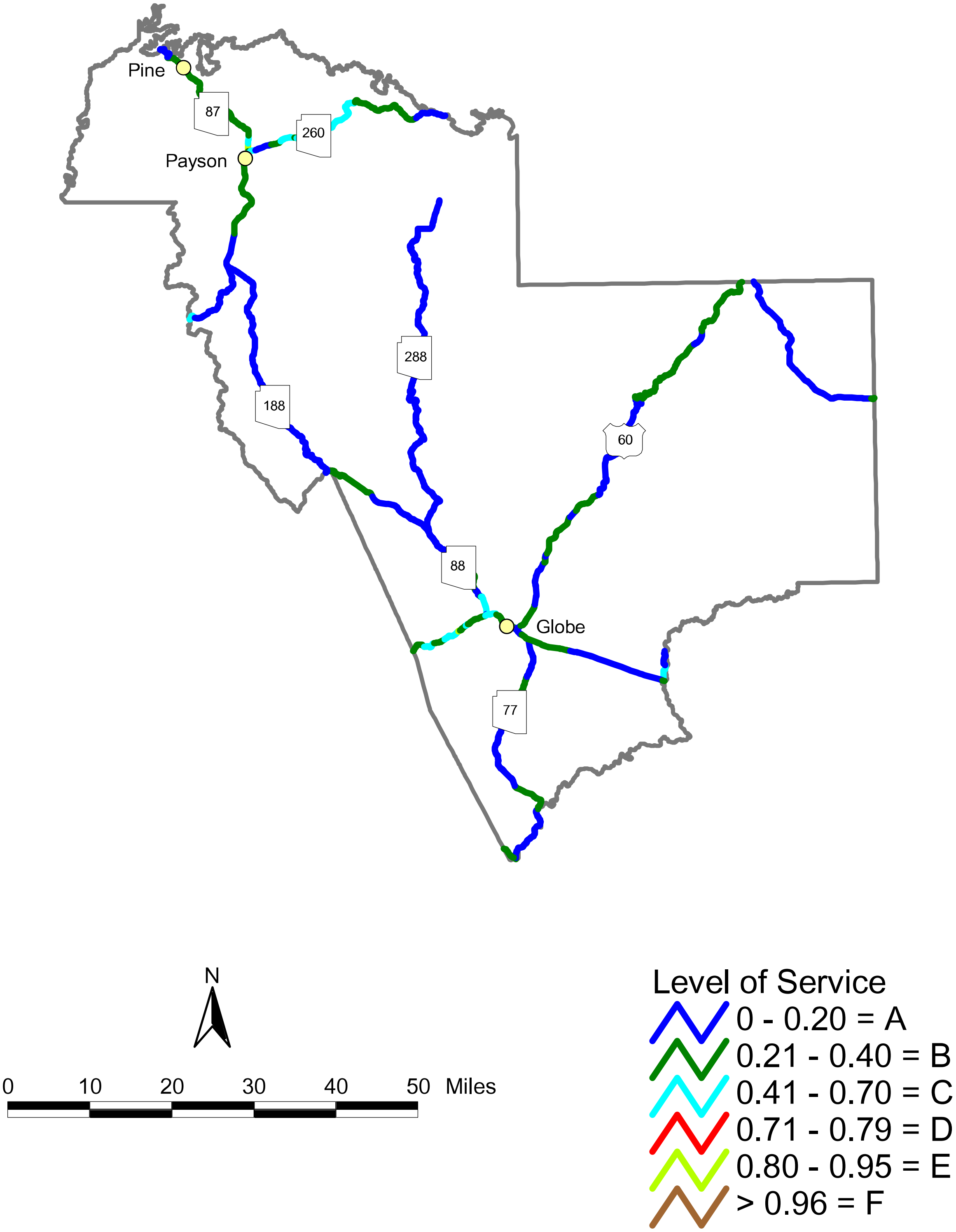
LEVEL OF SERVICE IN COCHISE COUNTY



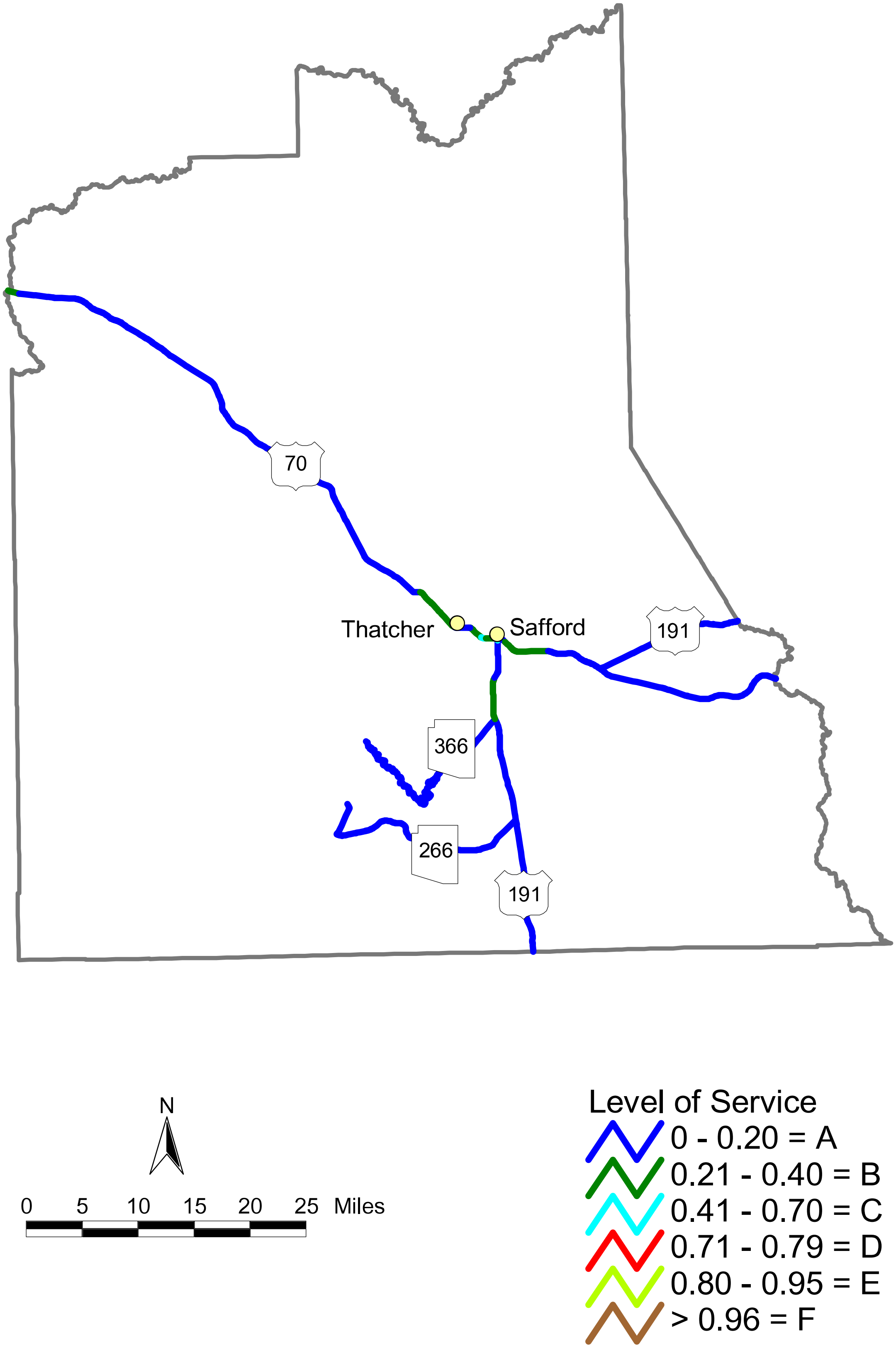
LEVEL OF SERVICE IN COCONINO COUNTY



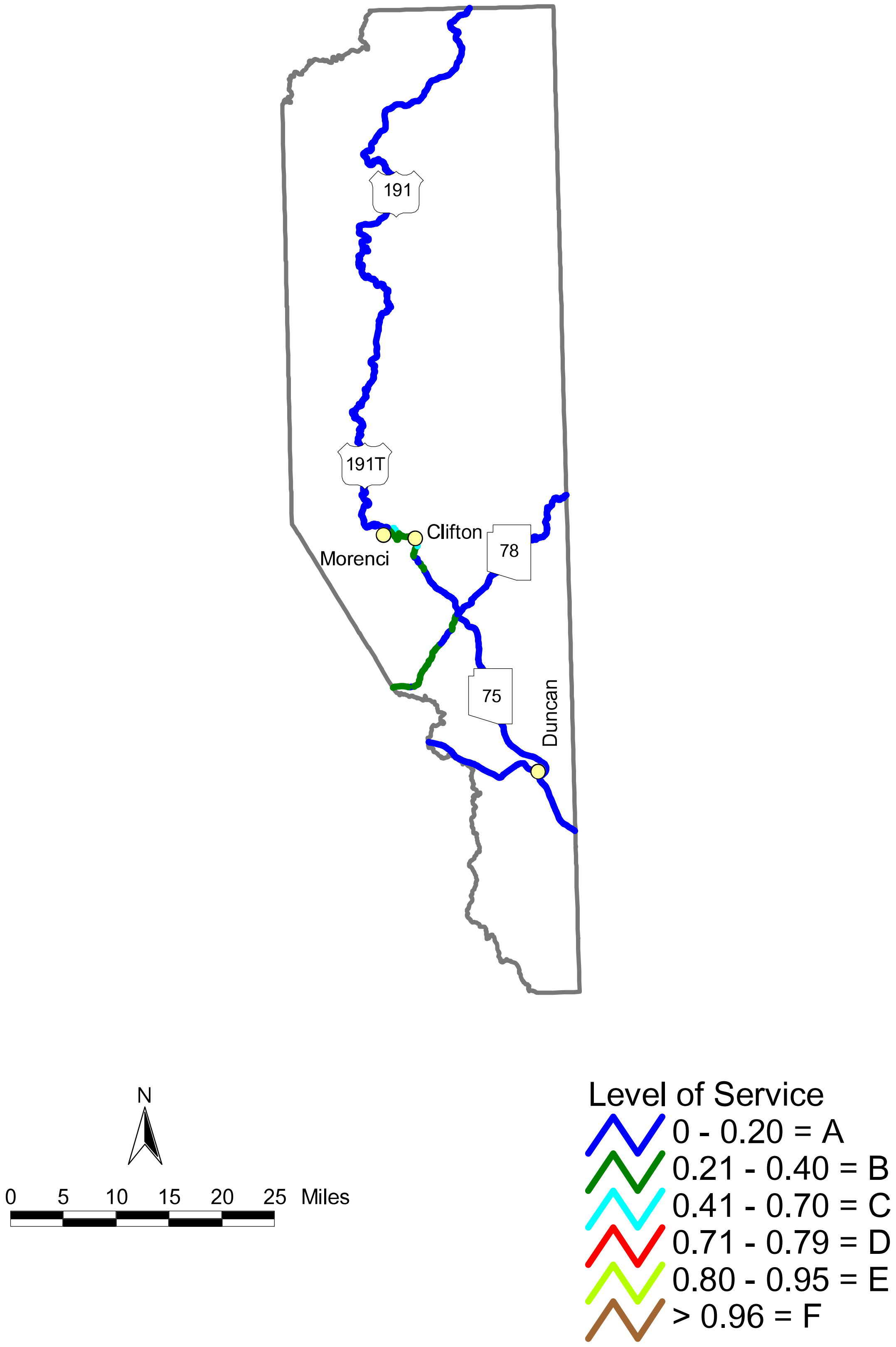
LEVEL OF SERVICE IN GILA COUNTY



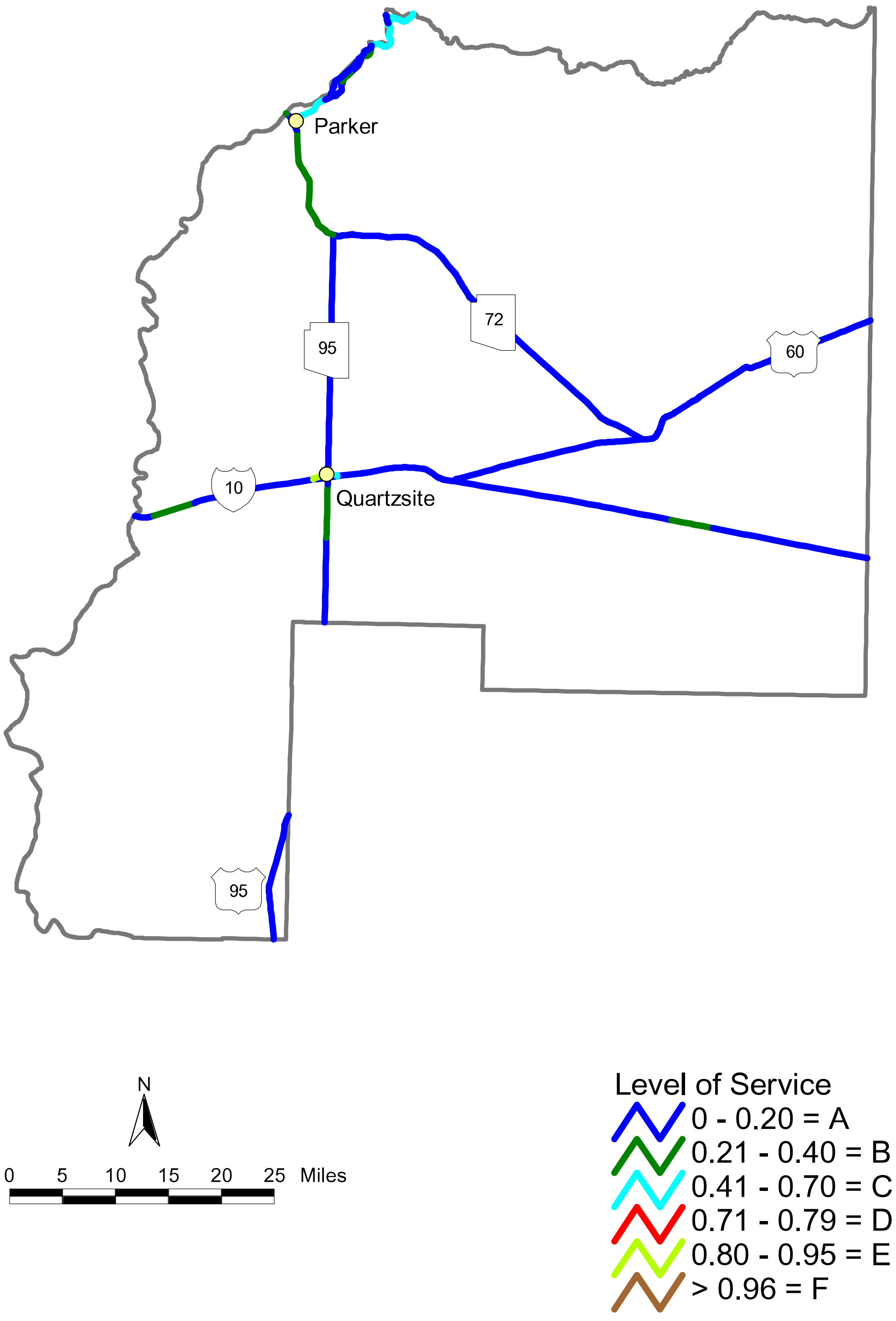
LEVEL OF SERVICE IN GRAHAM COUNTY



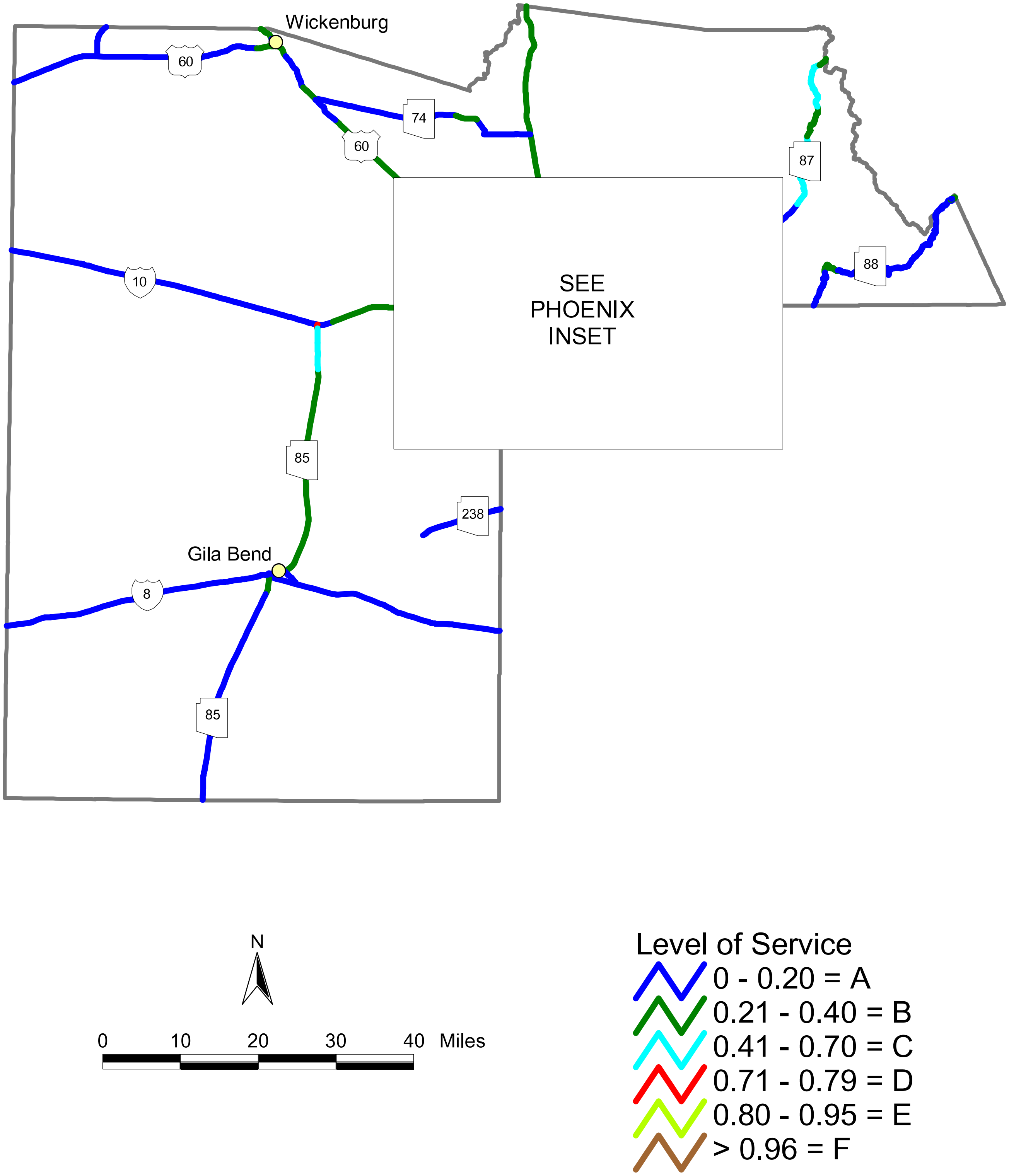
LEVEL OF SERVICE IN GREENLEE COUNTY



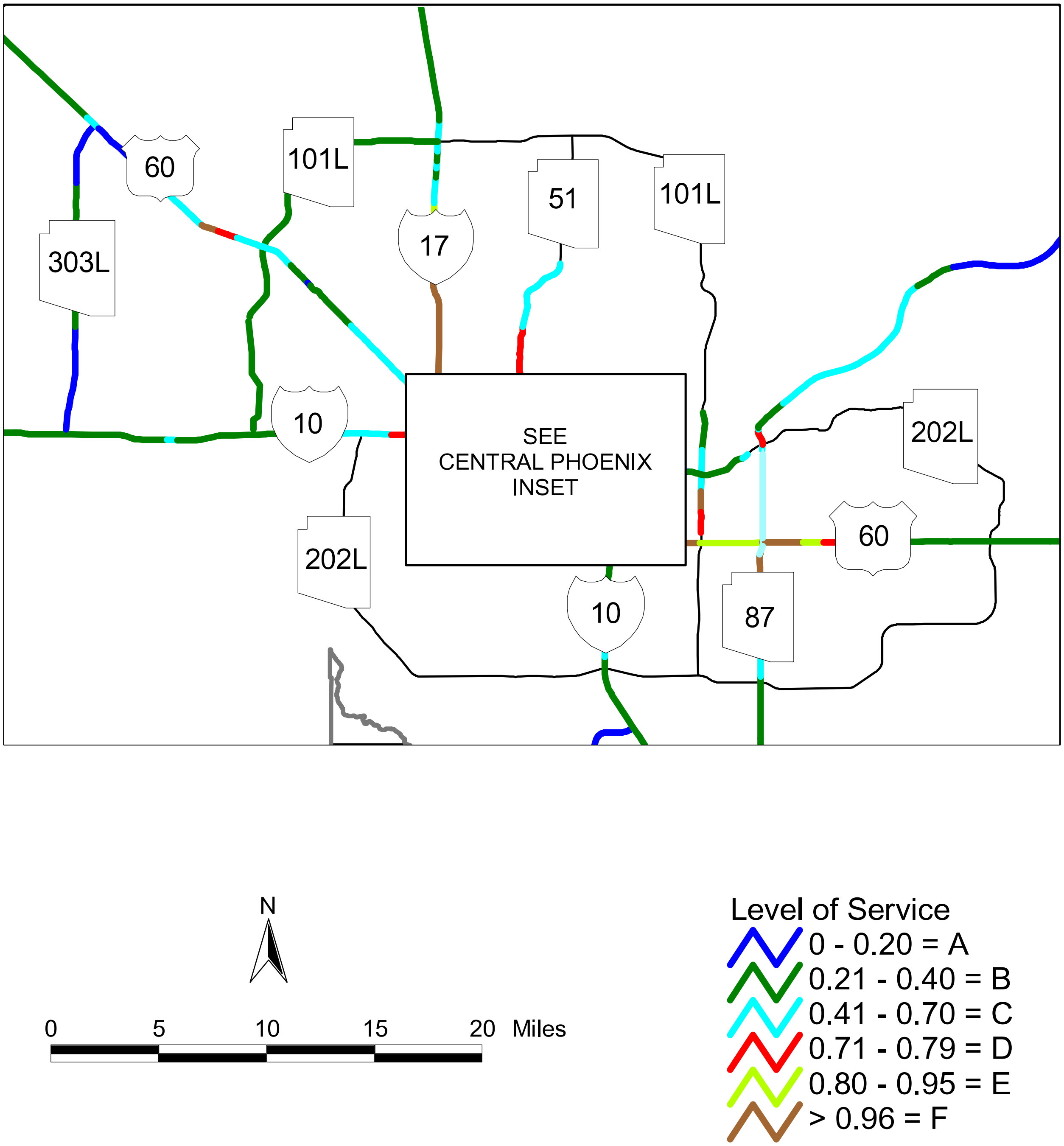
LEVEL OF SERVICE IN LA PAZ COUNTY



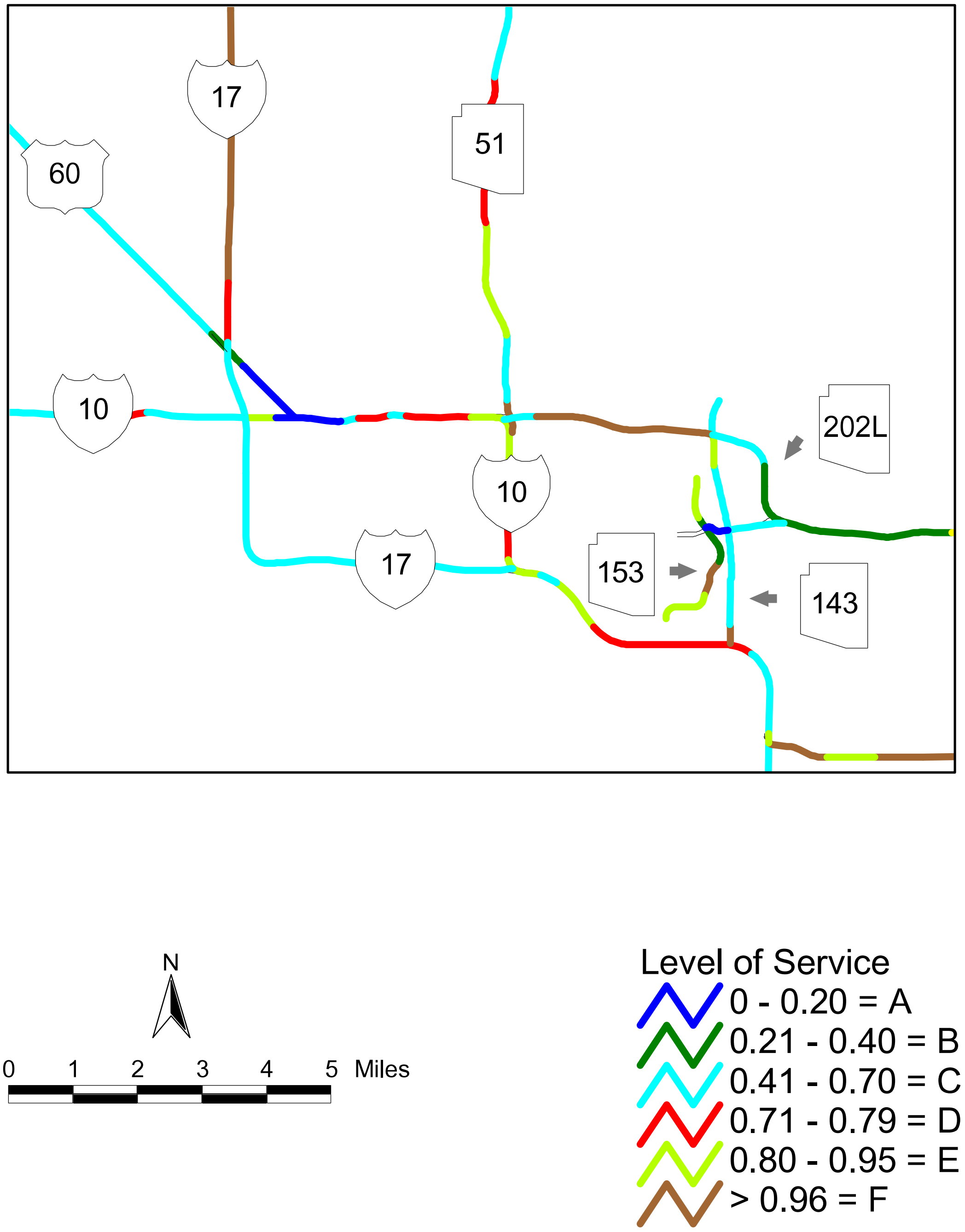
LEVEL OF SERVICE IN MARICOPA COUNTY



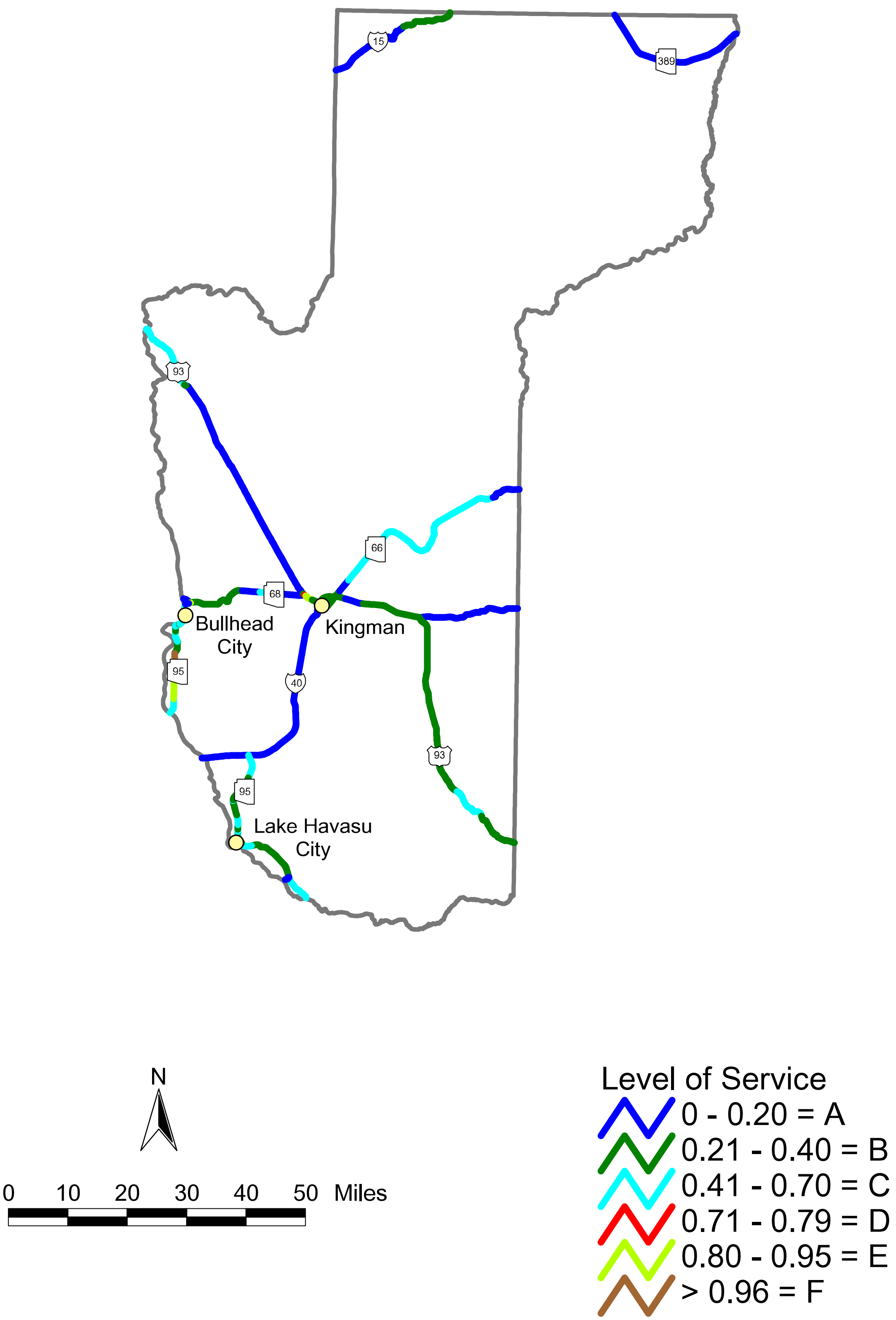
INSET
LEVEL OF SERVICE IN THE
PHOENIX METROPOLITAN AREA



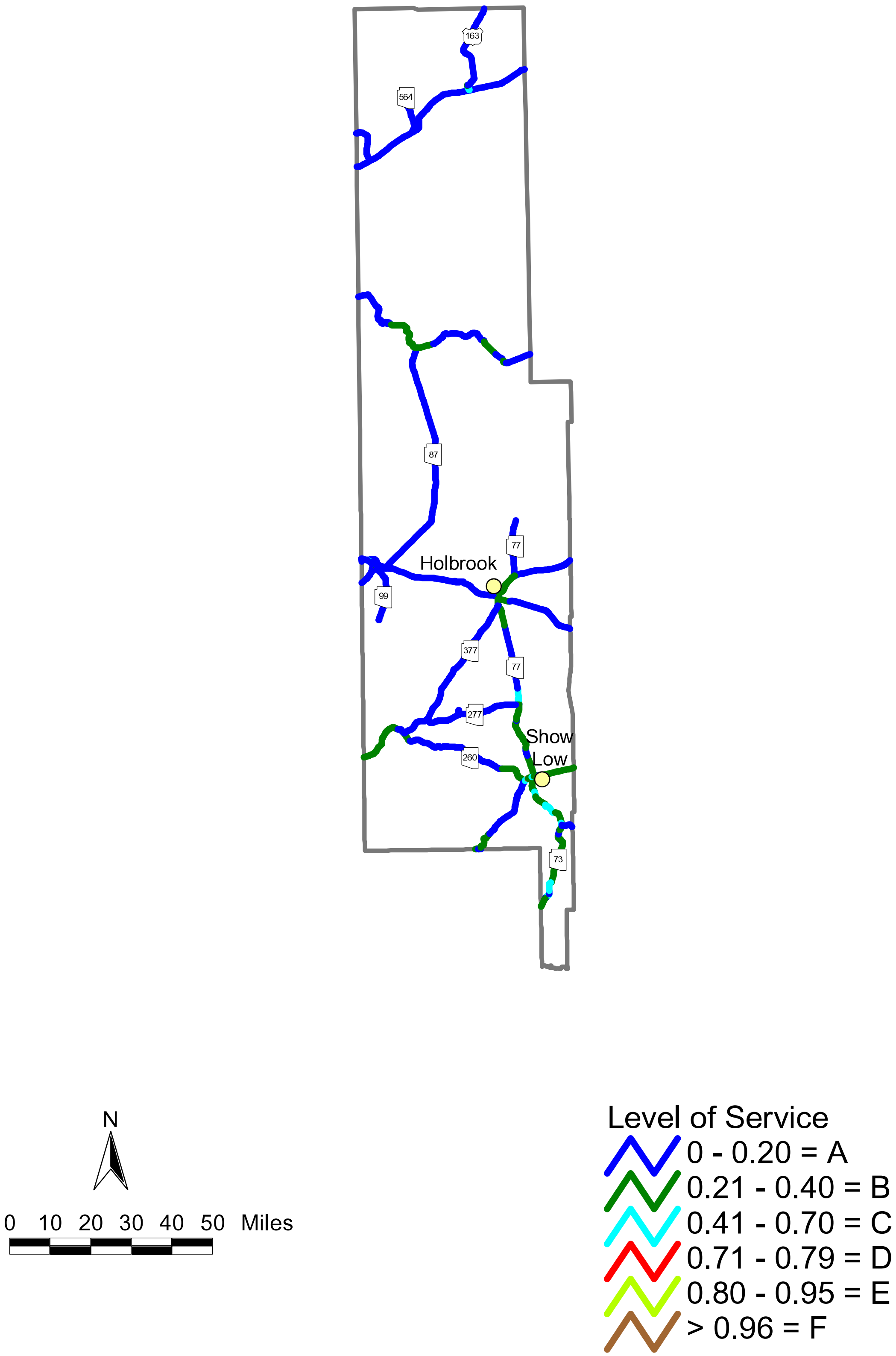
INSET
LEVEL OF SERVICE IN CENTRAL PHOENIX



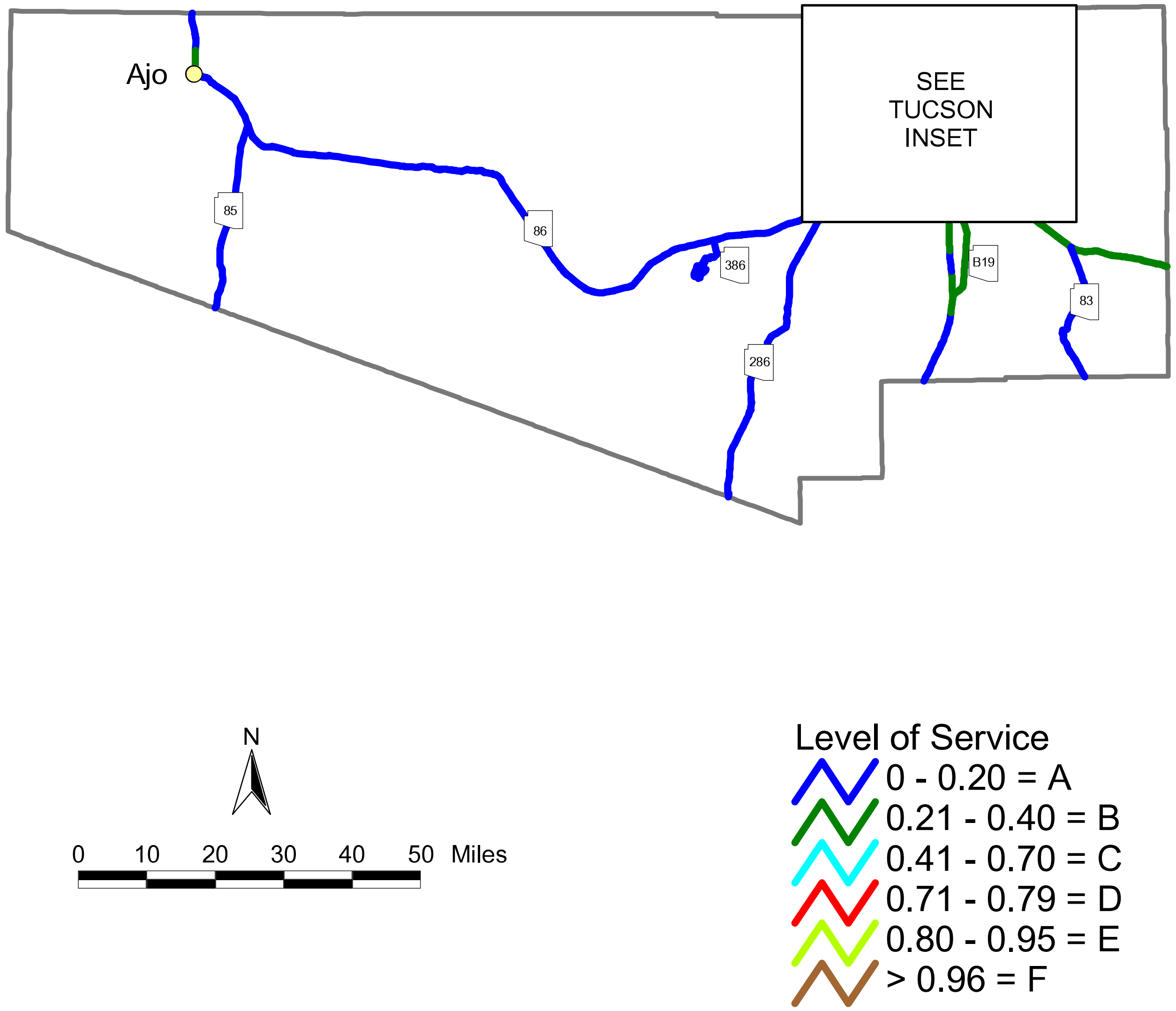
LEVEL OF SERVICE IN MOHAVE COUNTY



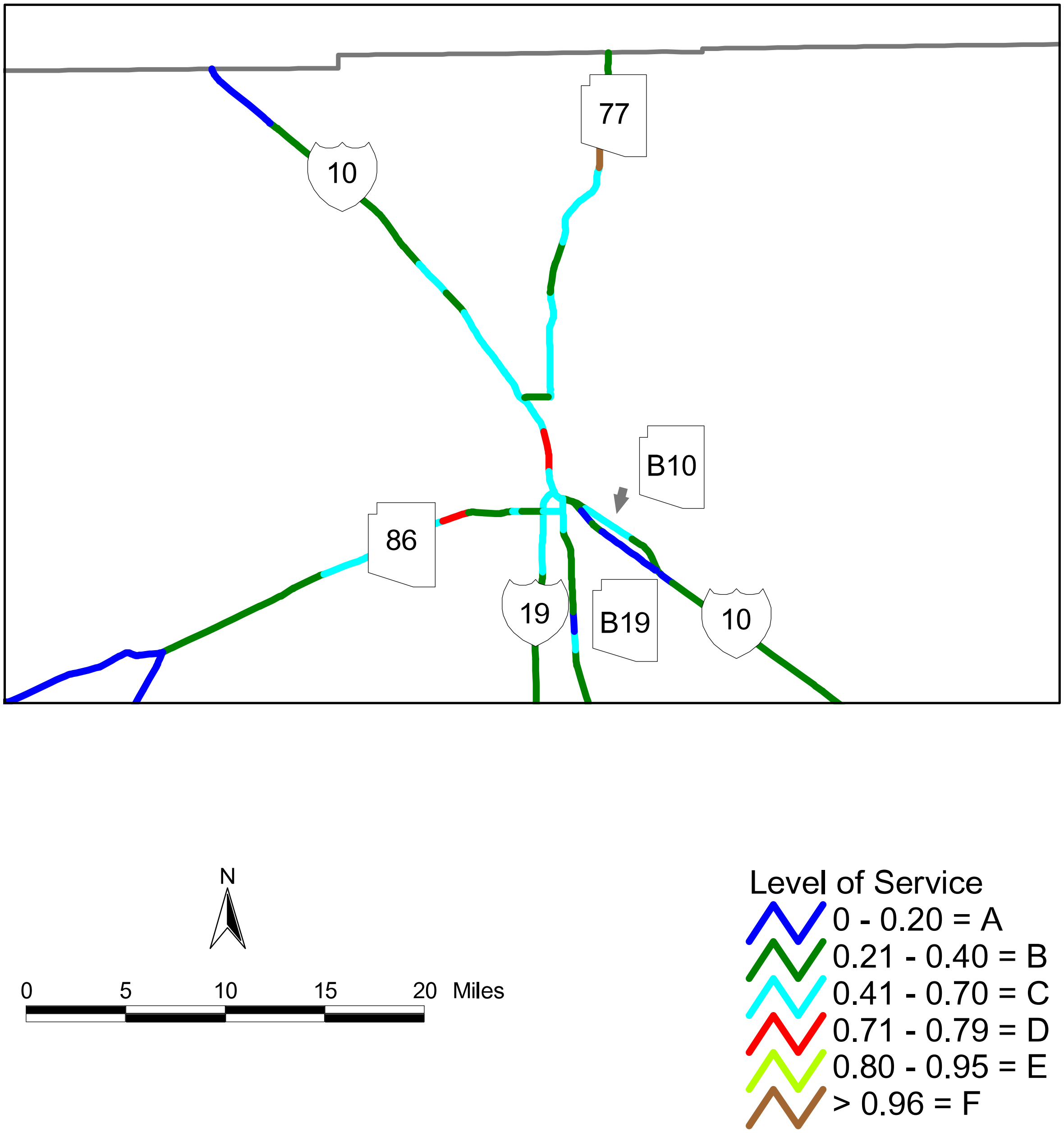
LEVEL OF SERVICE IN NAVAJO COUNTY



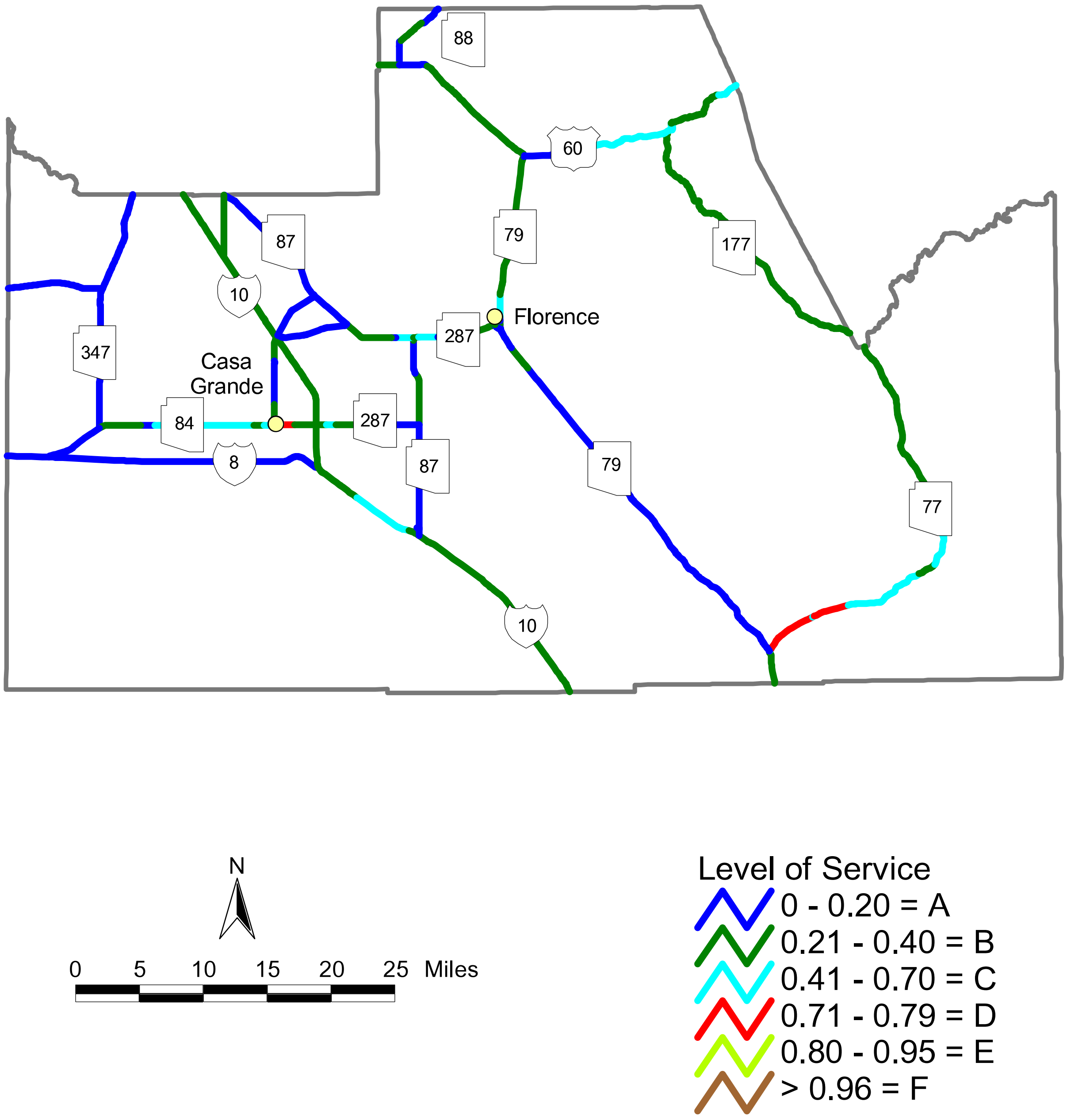
LEVEL OF SERVICE IN PIMA COUNTY



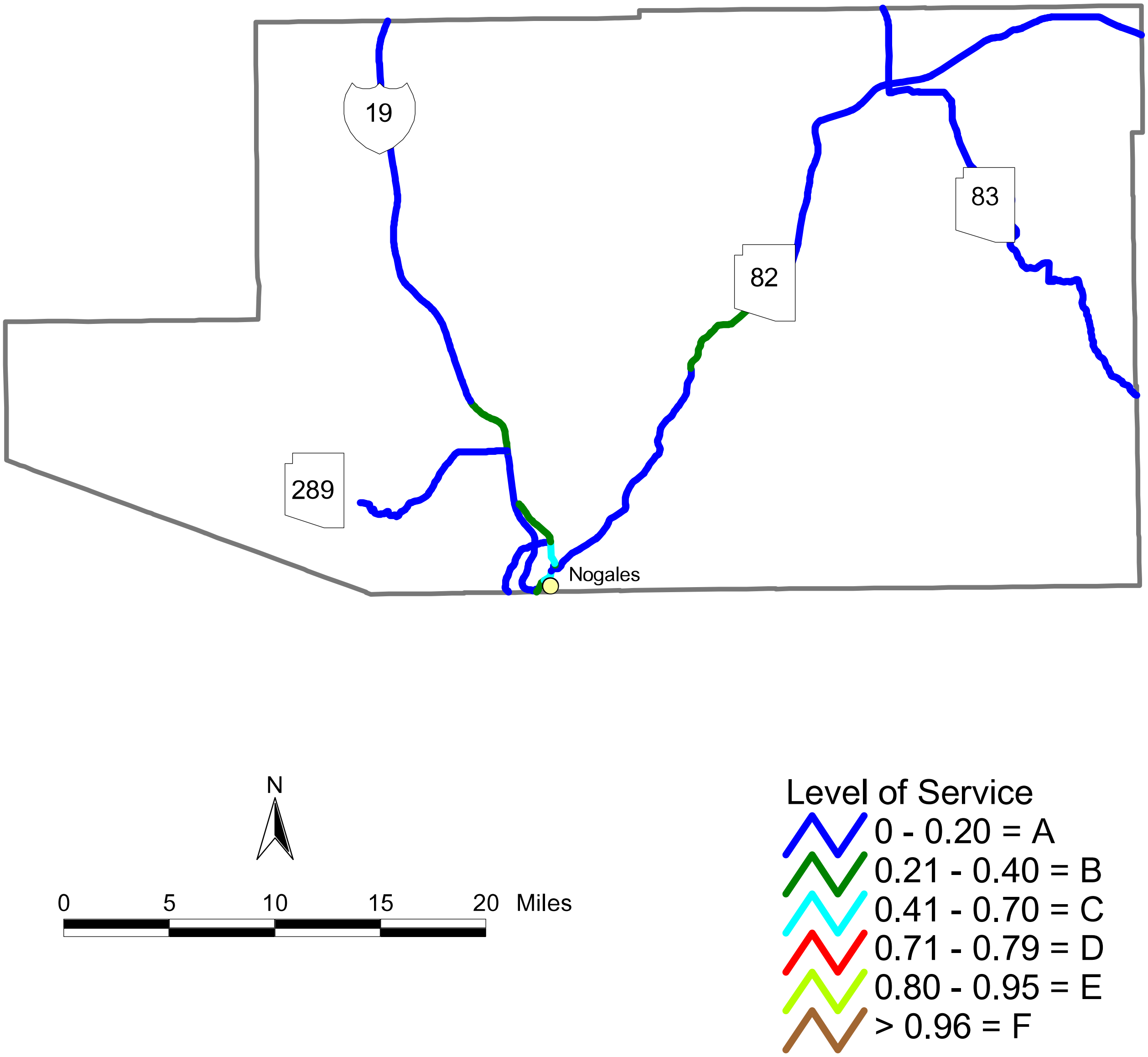
INSET
LEVEL OF SERVICE IN THE
TUCSON METROPOLITAN AREA



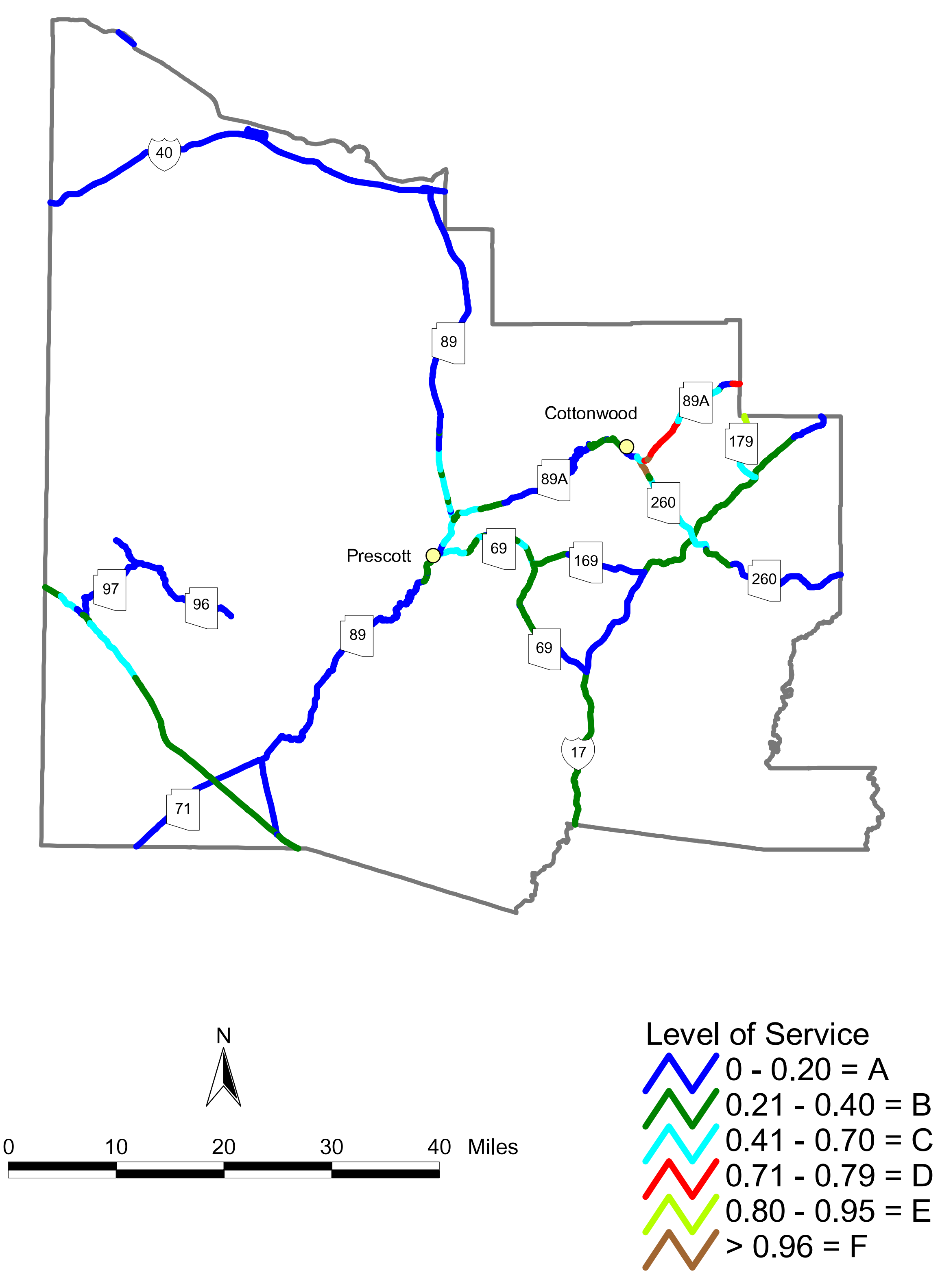
LEVEL OF SERVICE IN PINAL COUNTY



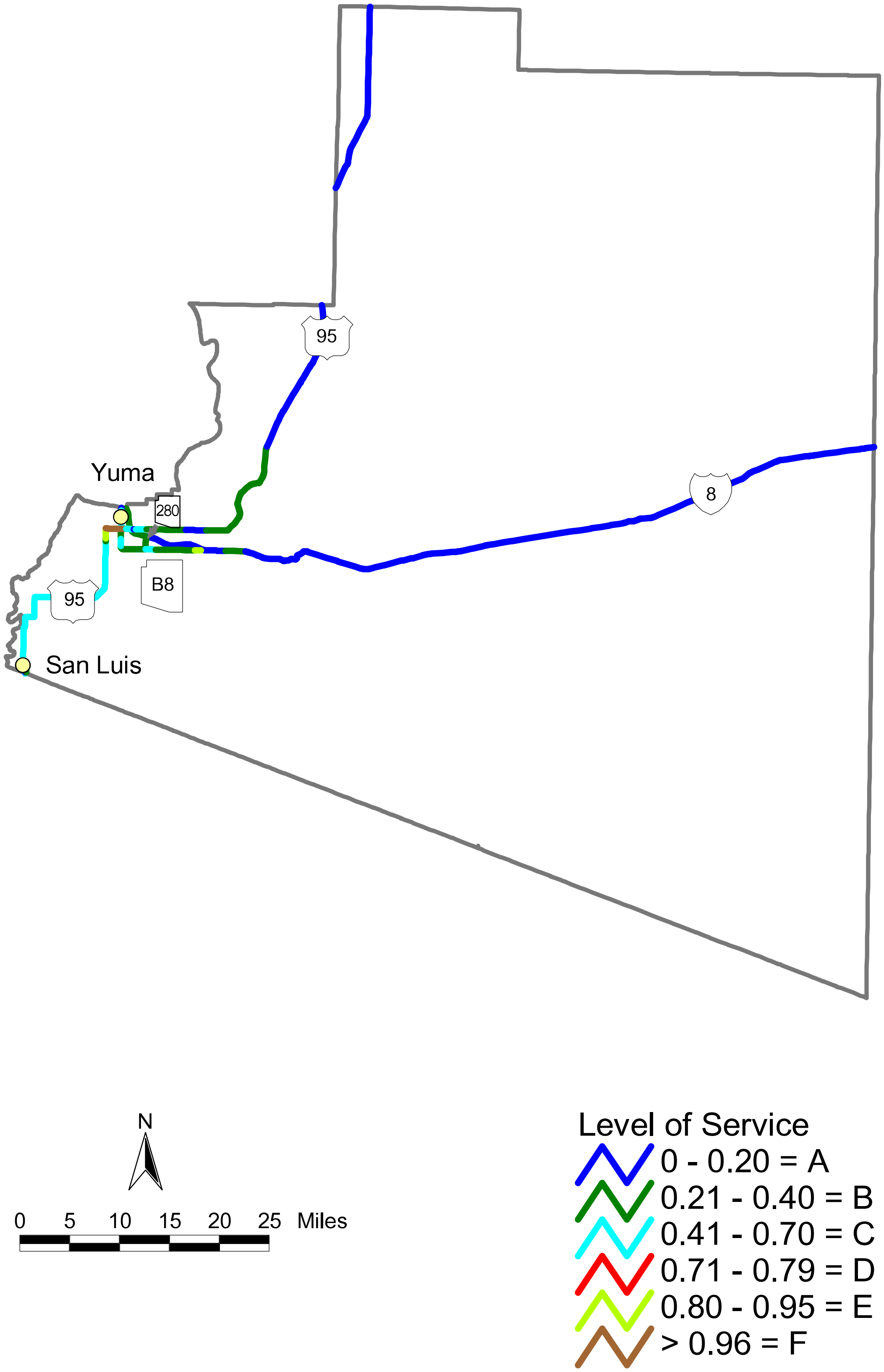
LEVEL OF SERVICE IN SANTA CRUZ COUNTY



LEVEL OF SERVICE IN YAVAPAI COUNTY



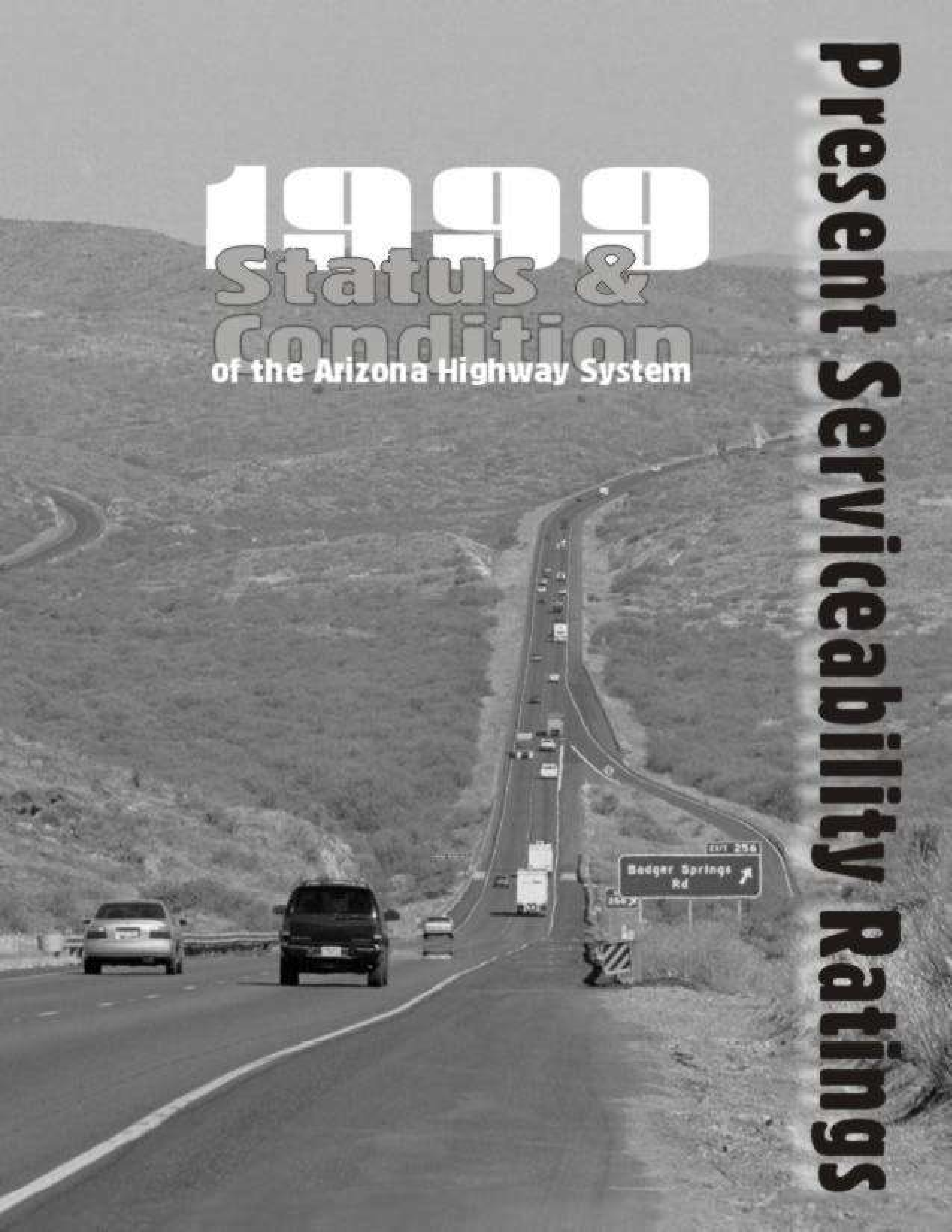
LEVEL OF SERVICE IN YUMA COUNTY



1999 Status & Condition

of the Arizona Highway System

Present Serviceability Ratings



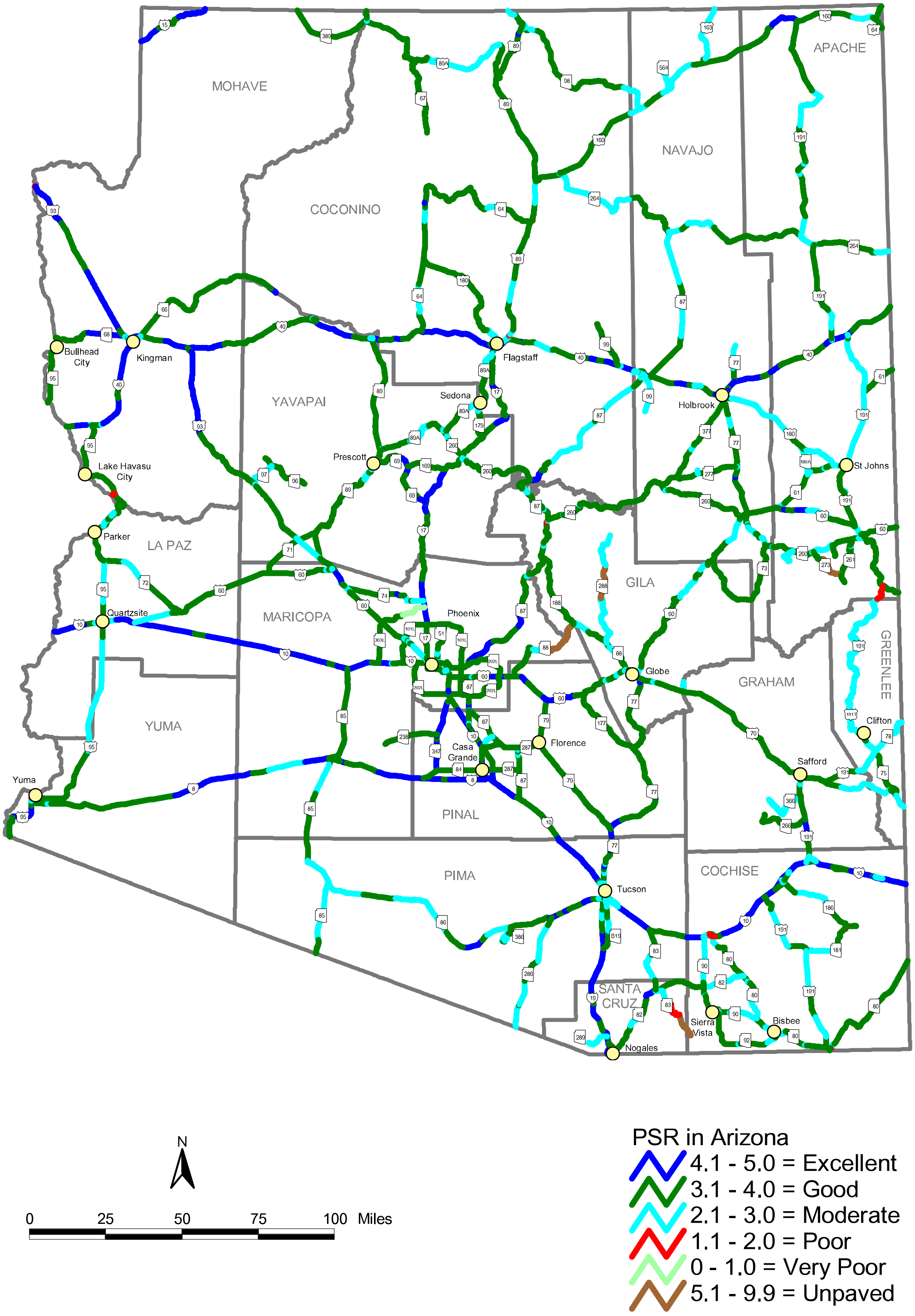
Present Serviceabilty Rating

The Present Serviceabilty Rating (PSR) is derived from readings taken by a mechanical device that measures deviations in the roadway surface. The deviations provide a measure of the smoothness or roughness of the pavement. The PSR rates the pavement condition on a scale from 0 to 5, with 0 being very poor (undriveable) and 5 being excellent (new surface). The pavement rating ranges and the conditions they indicate are as follows:

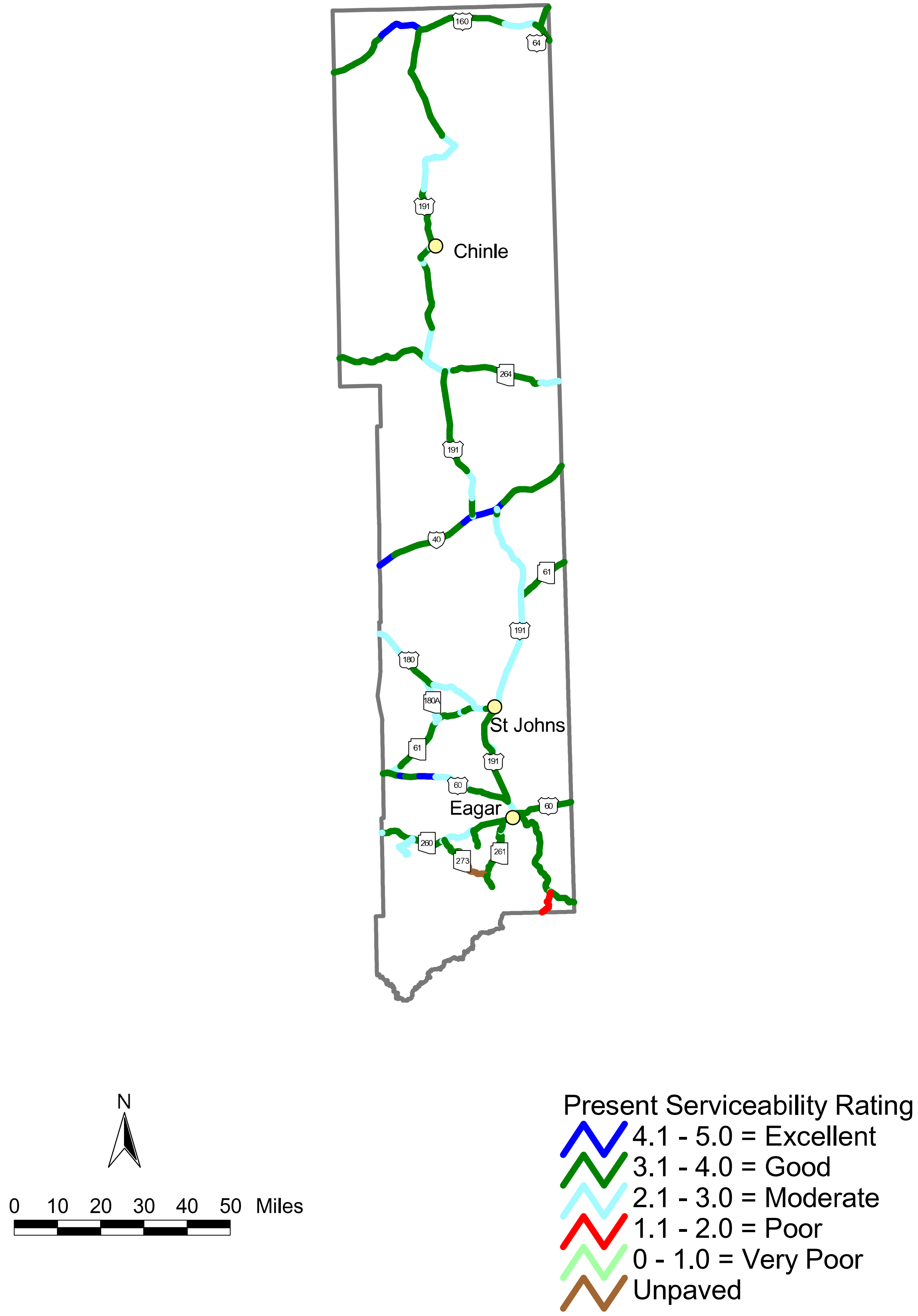
PSR	Condition	Indication
0 - 1.0	Very Poor	Extremely deteriorated
1.1-2.0	Poor	Has large pot holes,cracking,distress
2.1-3.0	Moderate	Barely tolerable for high speed traffic
3.1-4.0	Good	Relatively Smooth
4.1-5.0	Excellent	New or superior

The PSR data is mapped at the county level and inserts are used where appropriate.

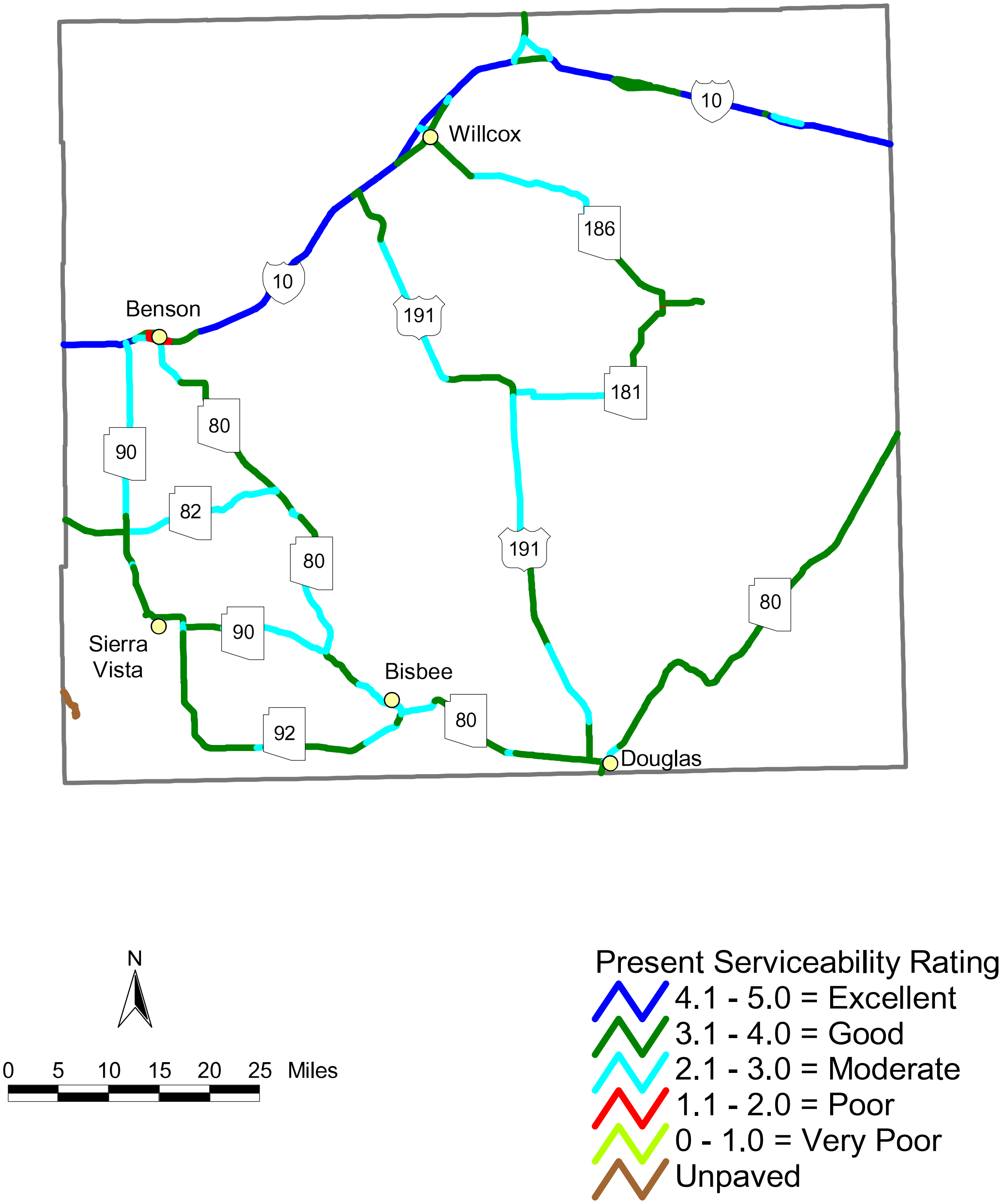
1999 PRESENT SERVICEABILITY RATING ON THE ARIZONA STATE HIGHWAY SYSTEM



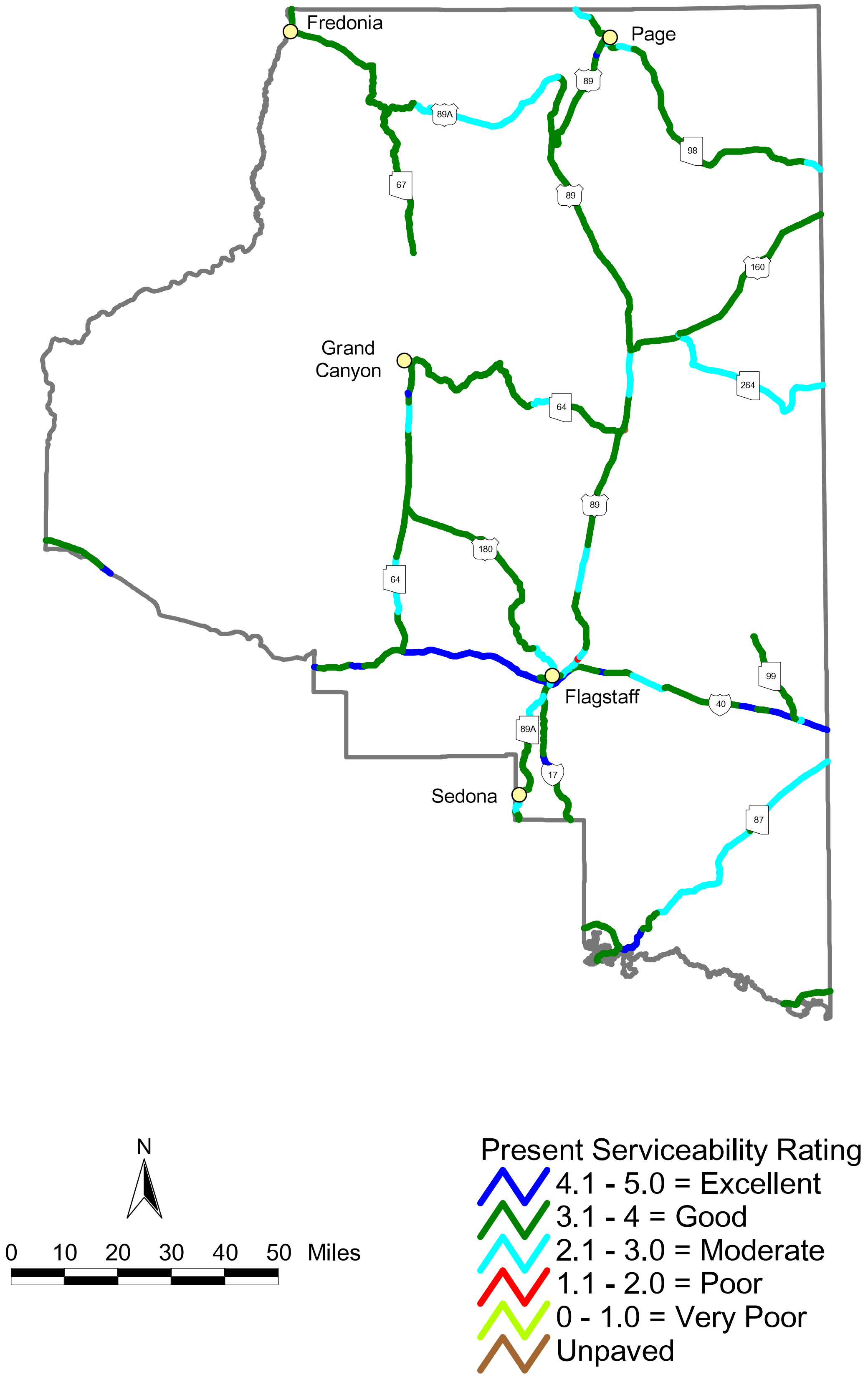
ROAD CONDITIONS IN APACHE COUNTY



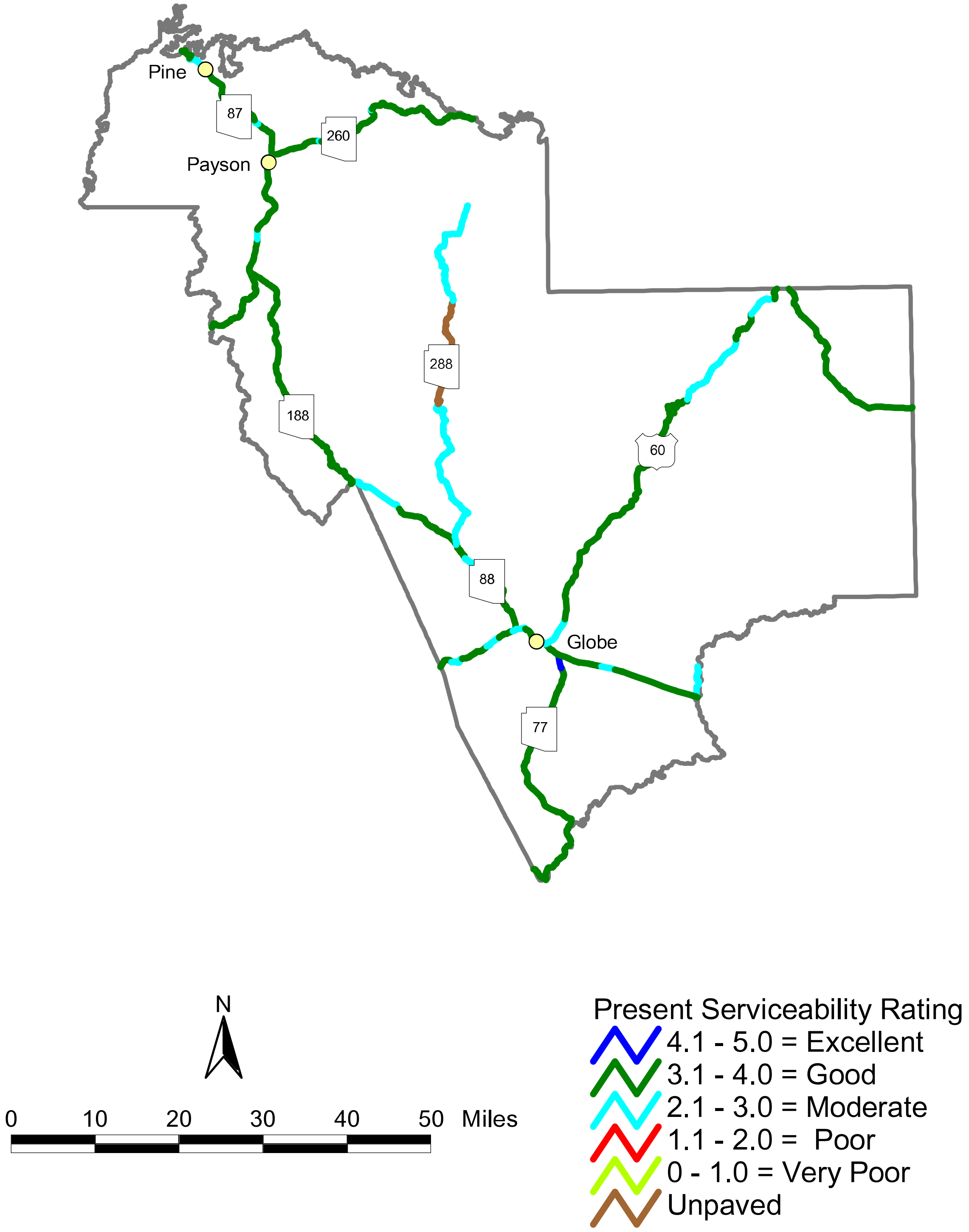
ROAD CONDITIONS IN COCHISE COUNTY



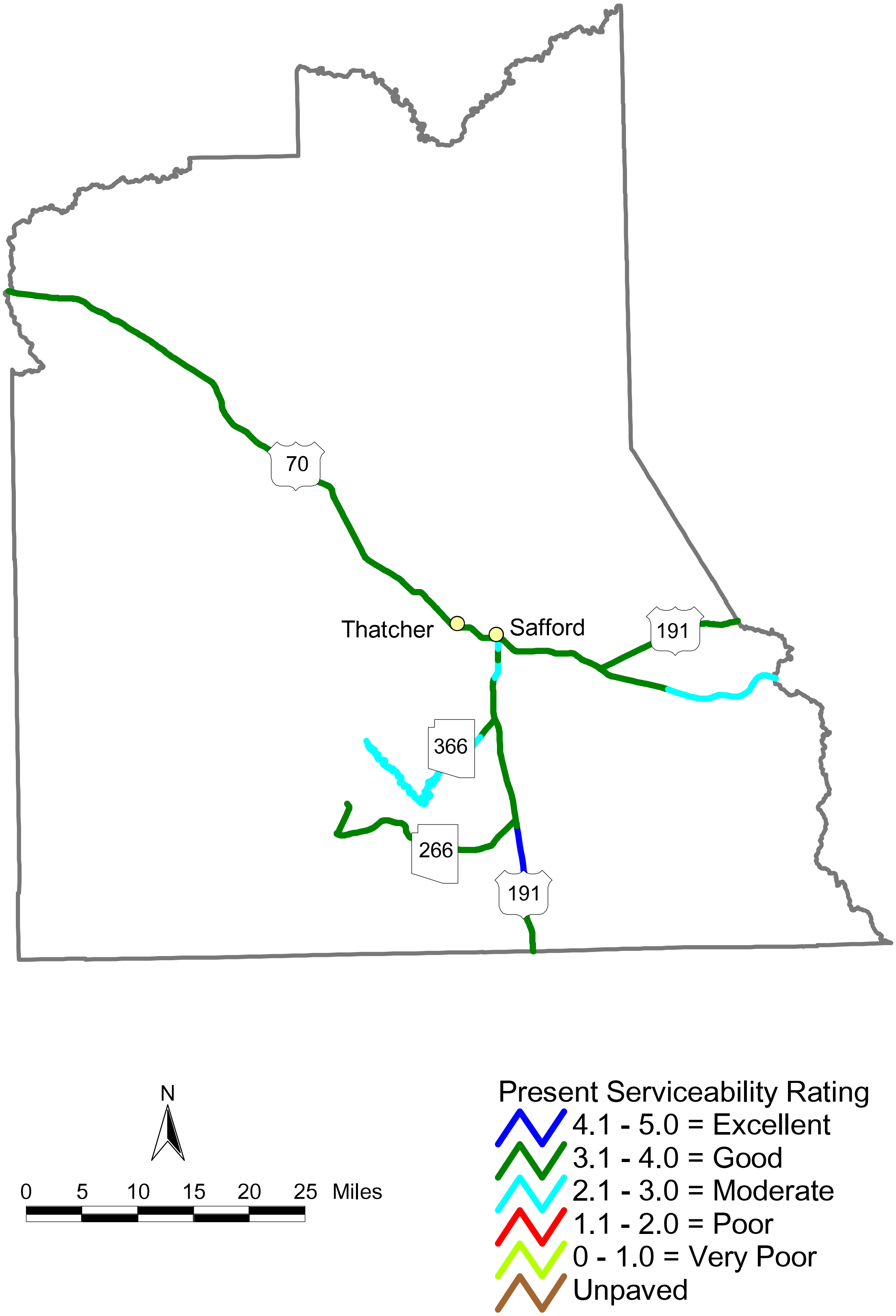
ROAD CONDITIONS IN COCONINO COUNTY



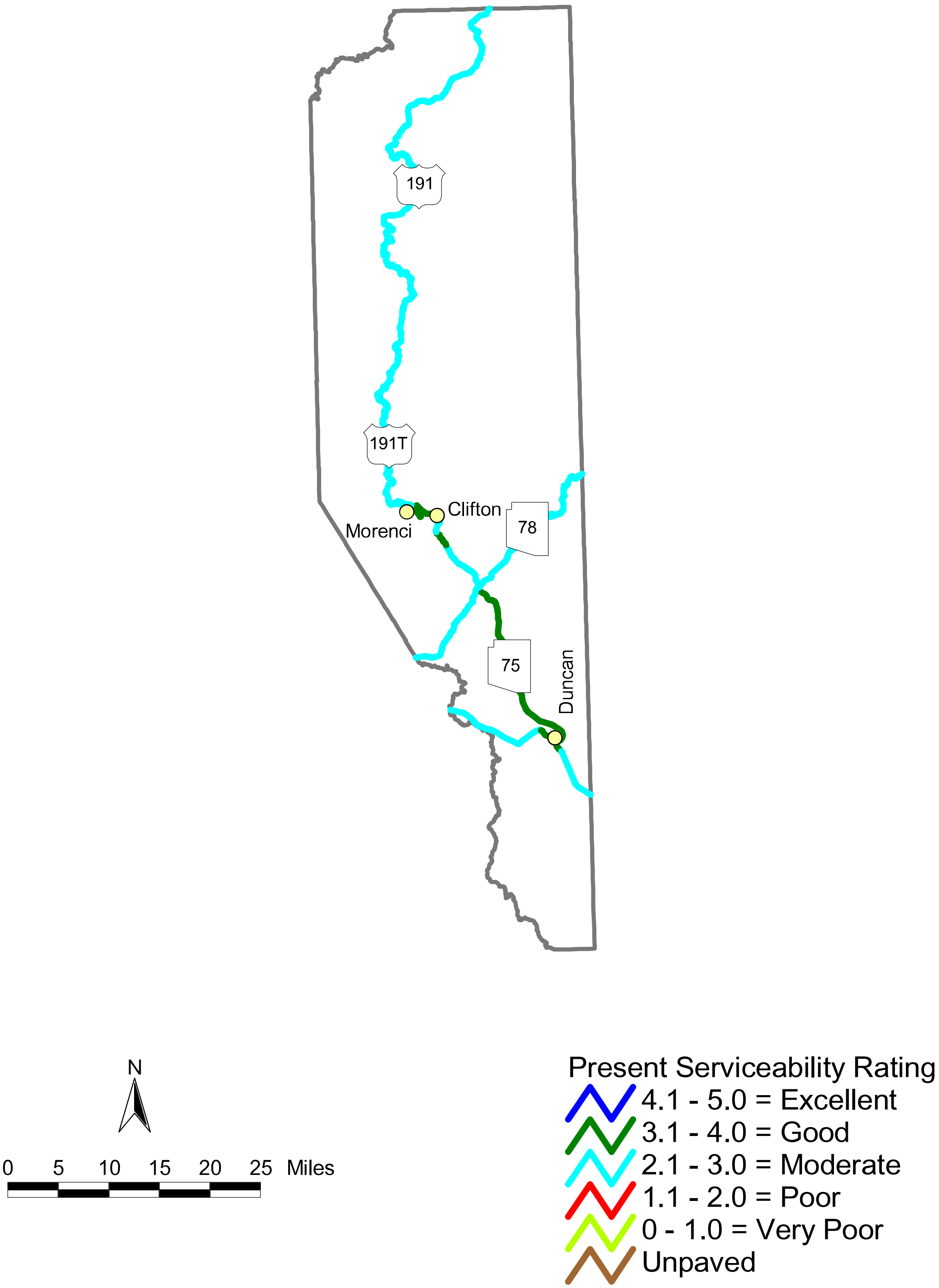
ROAD CONDITIONS IN GILA COUNTY



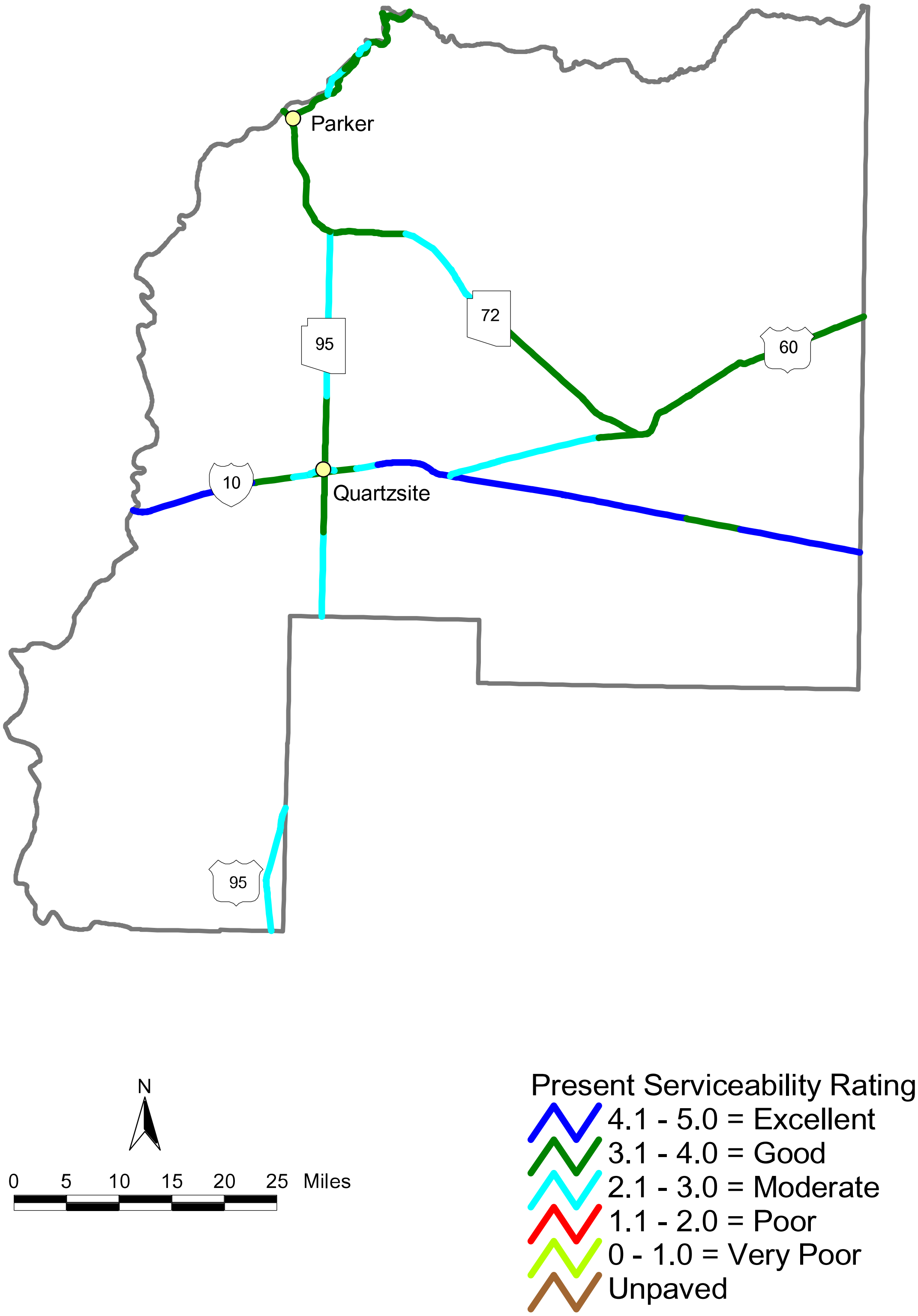
ROAD CONDITIONS IN GRAHAM COUNTY



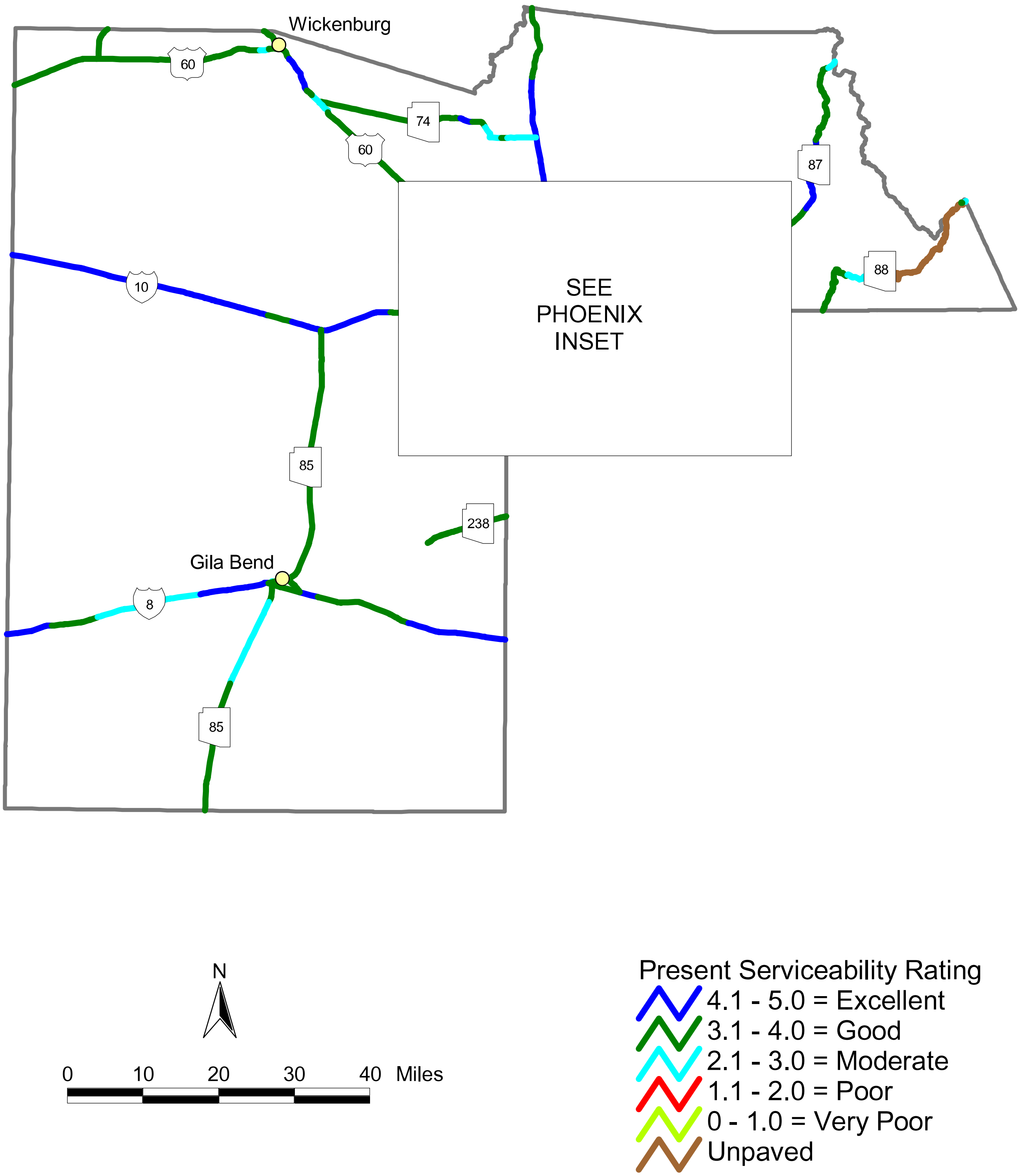
ROAD CONDITIONS IN GREENLEE COUNTY



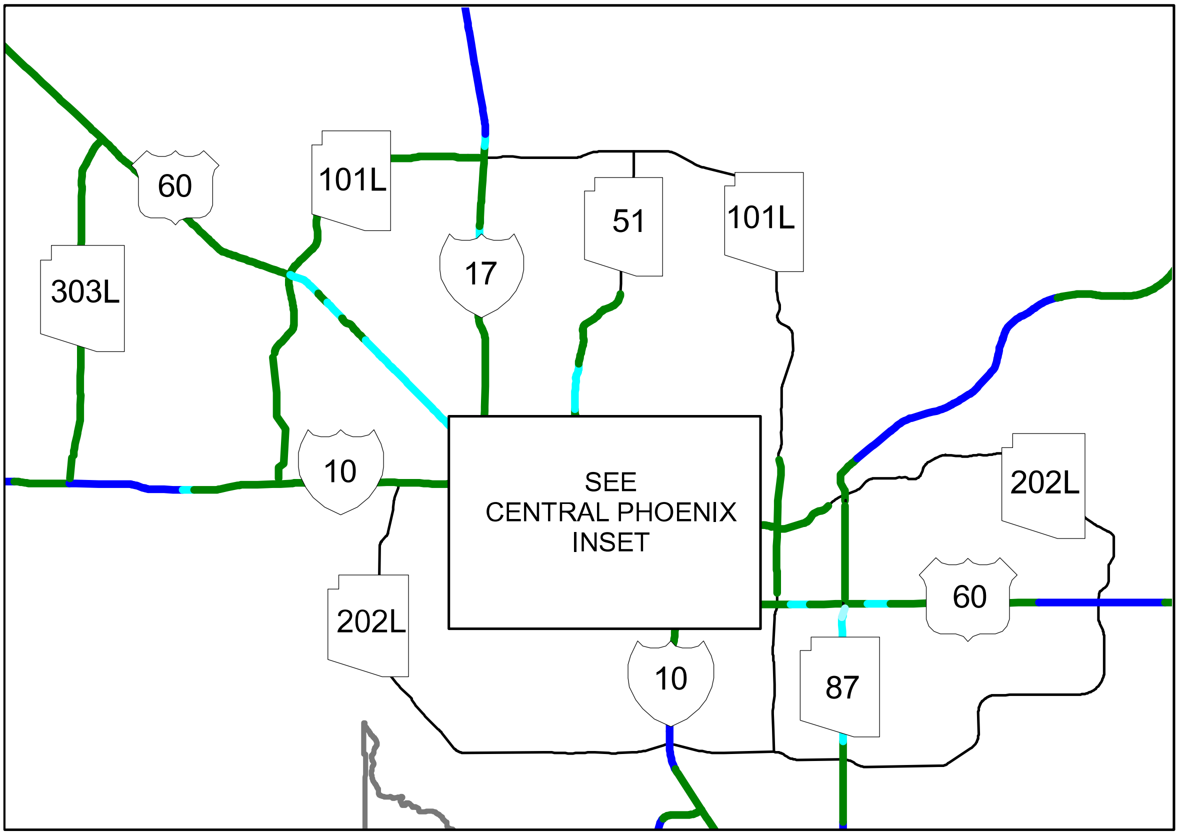
ROAD CONDITIONS IN LA PAZ COUNTY

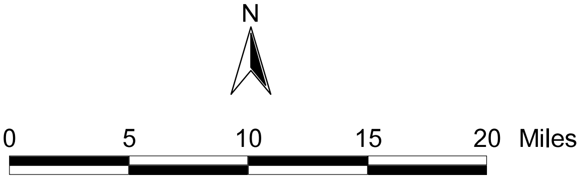


ROAD CONDITIONS IN MARICOPA COUNTY



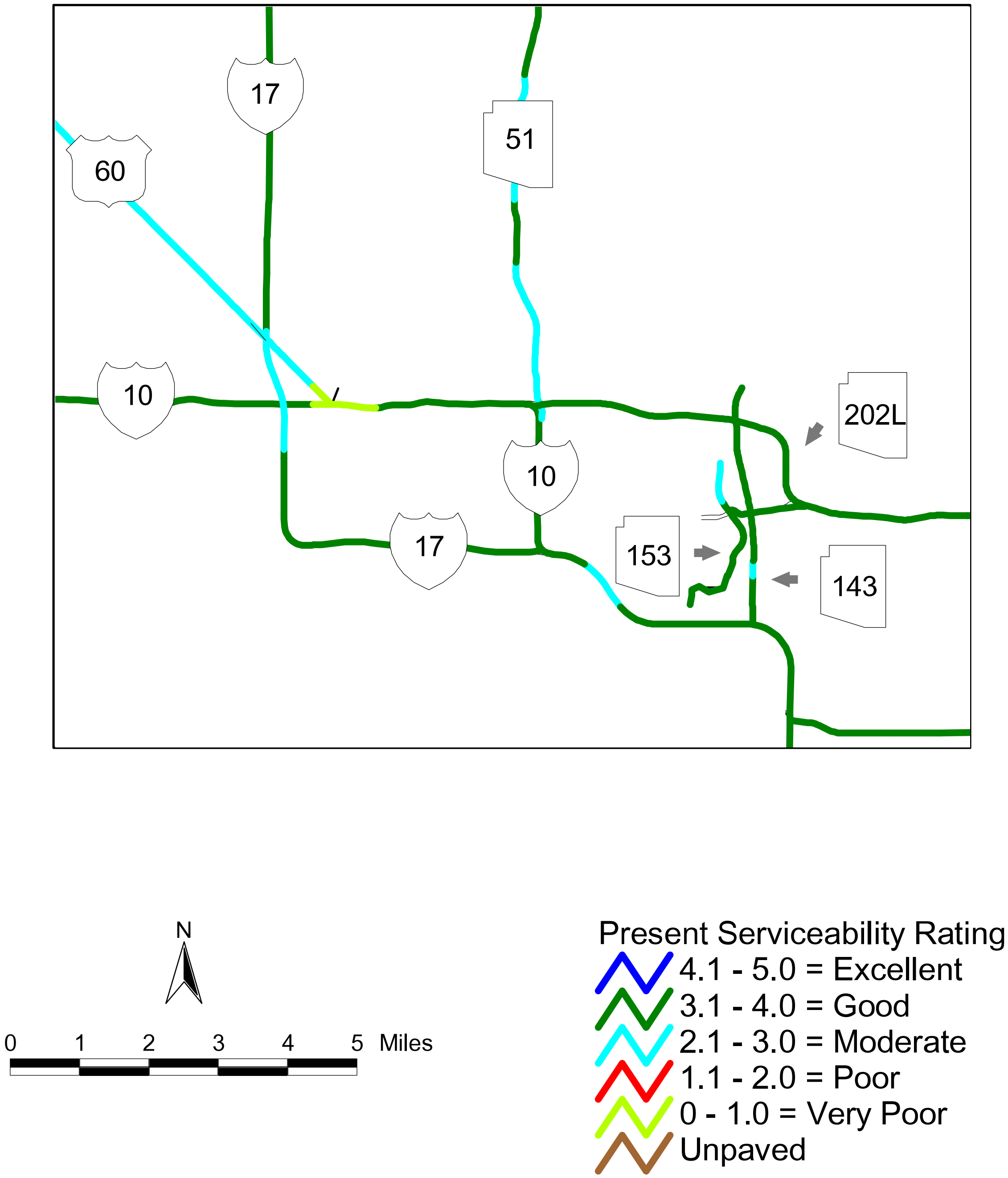
INSET
ROAD CONDITIONS IN THE
PHOENIX METROPOLITAN AREA



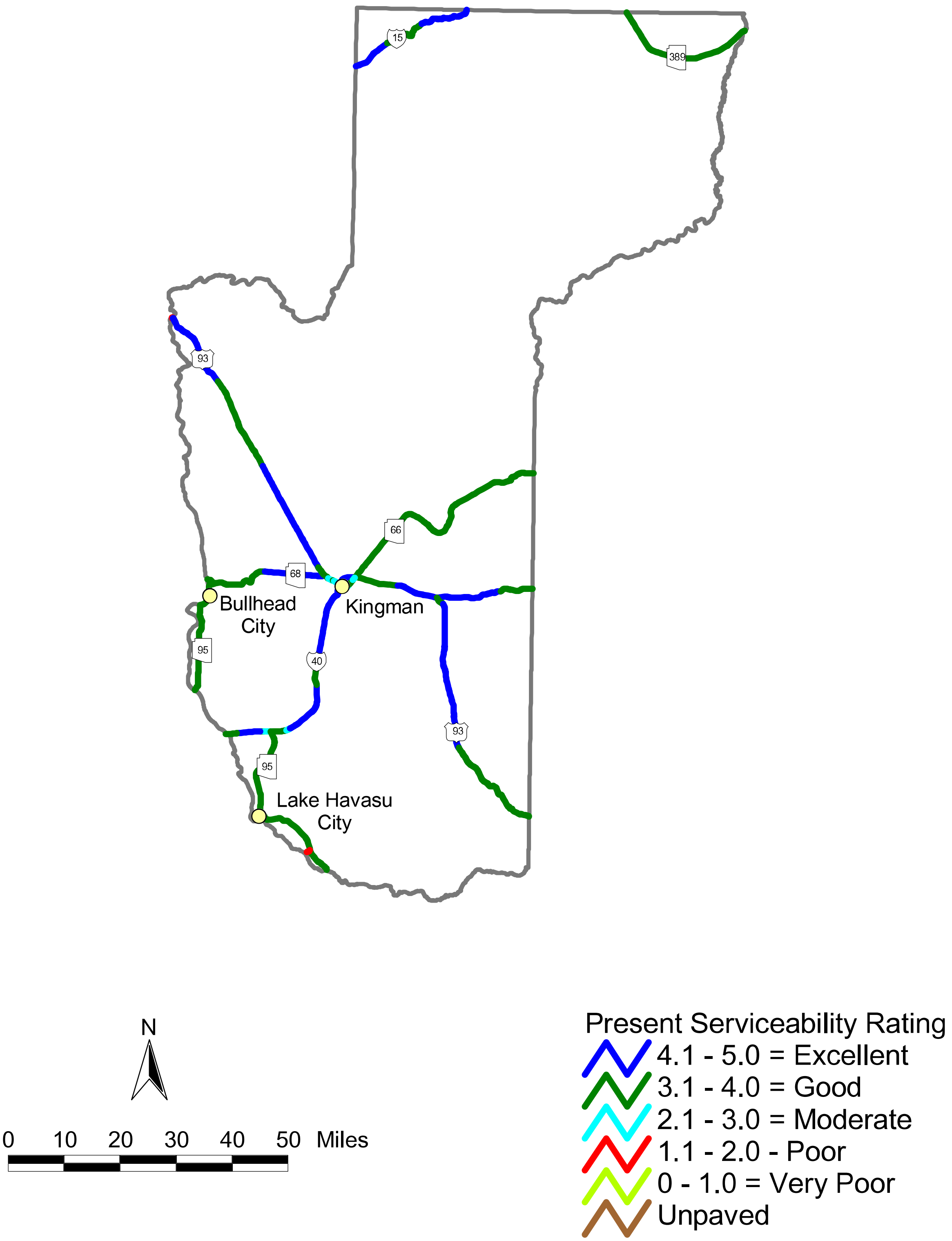


Present Serviceability Rating
4.1 - 5.0 = Excellent
3.1 - 4.0 = Good
2.1 - 3.0 = Moderate
1.1 - 2.0 = Poor
0 - 1.0 = Very Poor
Unpaved

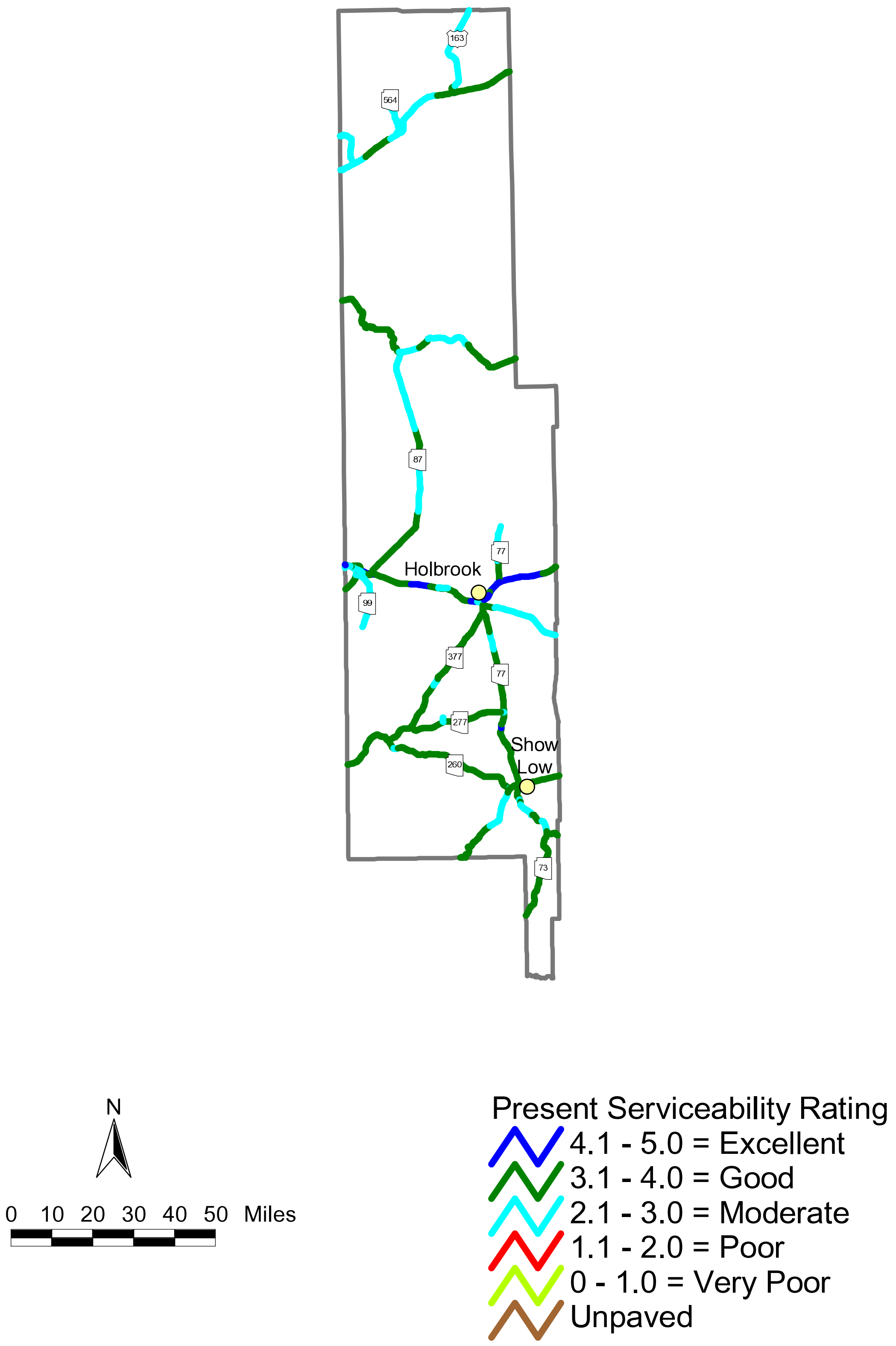
INSET
ROAD CONDITIONS IN
CENTRAL PHOENIX



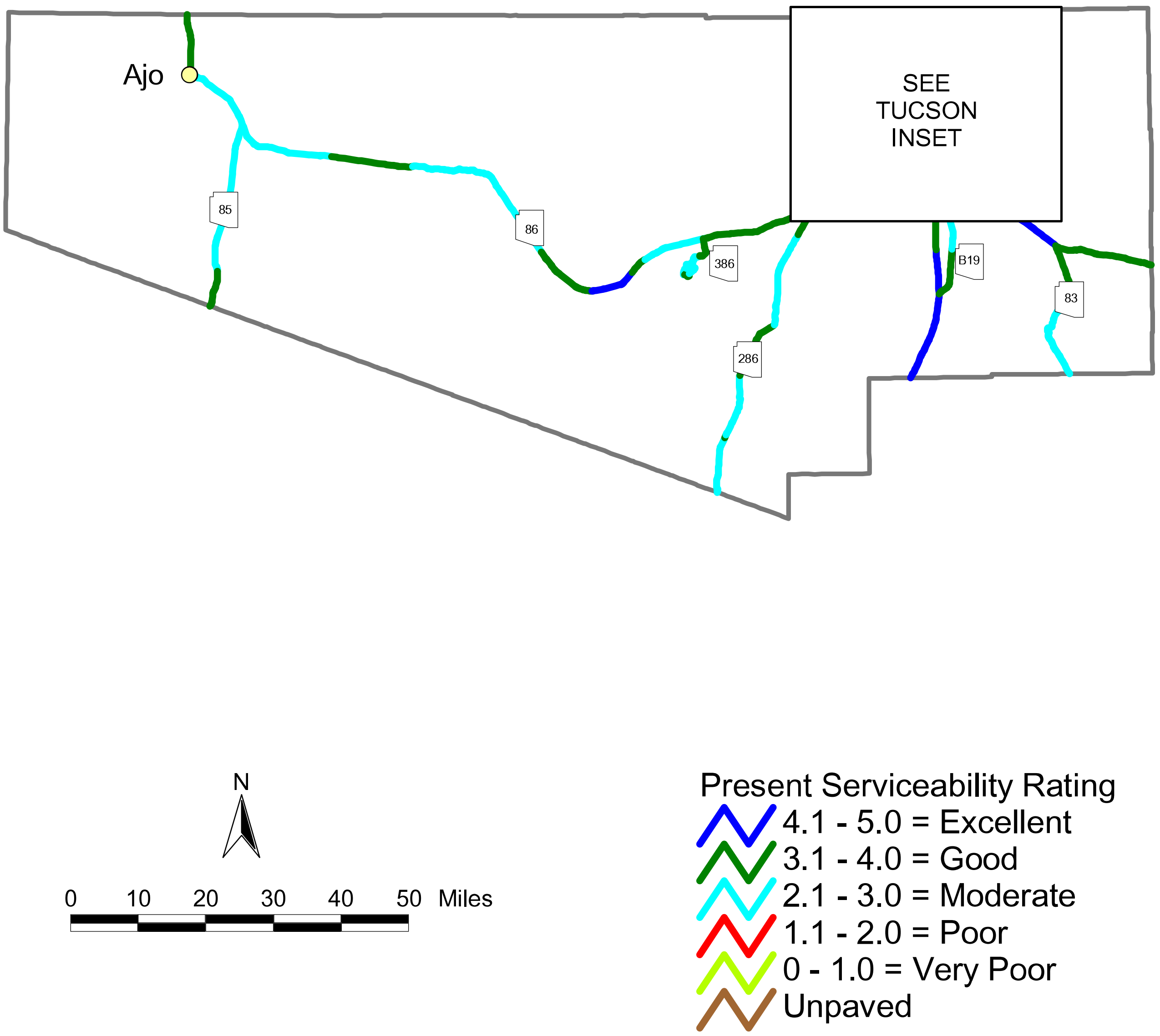
ROAD CONDITIONS IN MOHAVE COUNTY



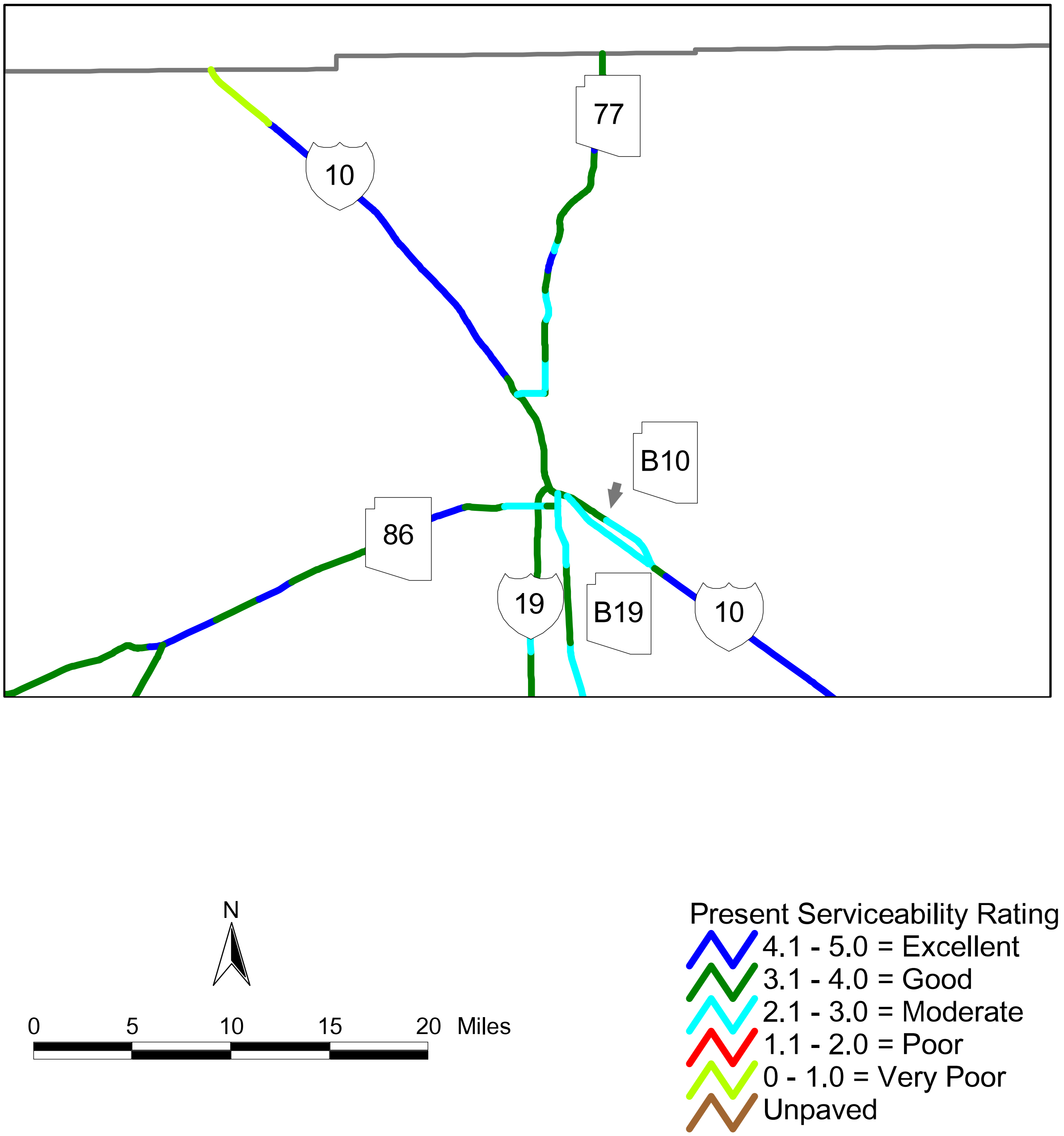
ROAD CONDITIONS IN NAVAJO COUNTY



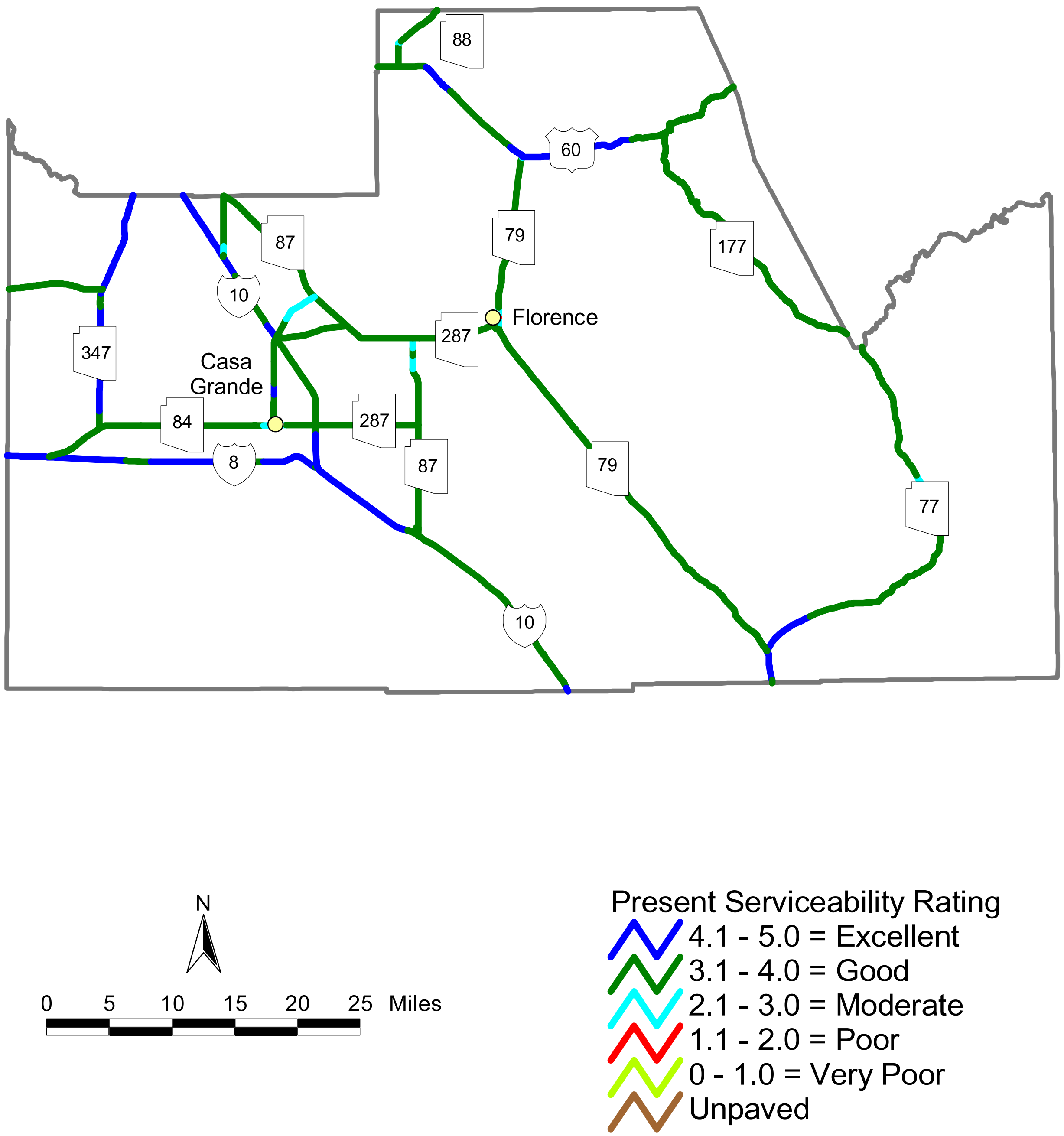
ROAD CONDITIONS IN PIMA COUNTY



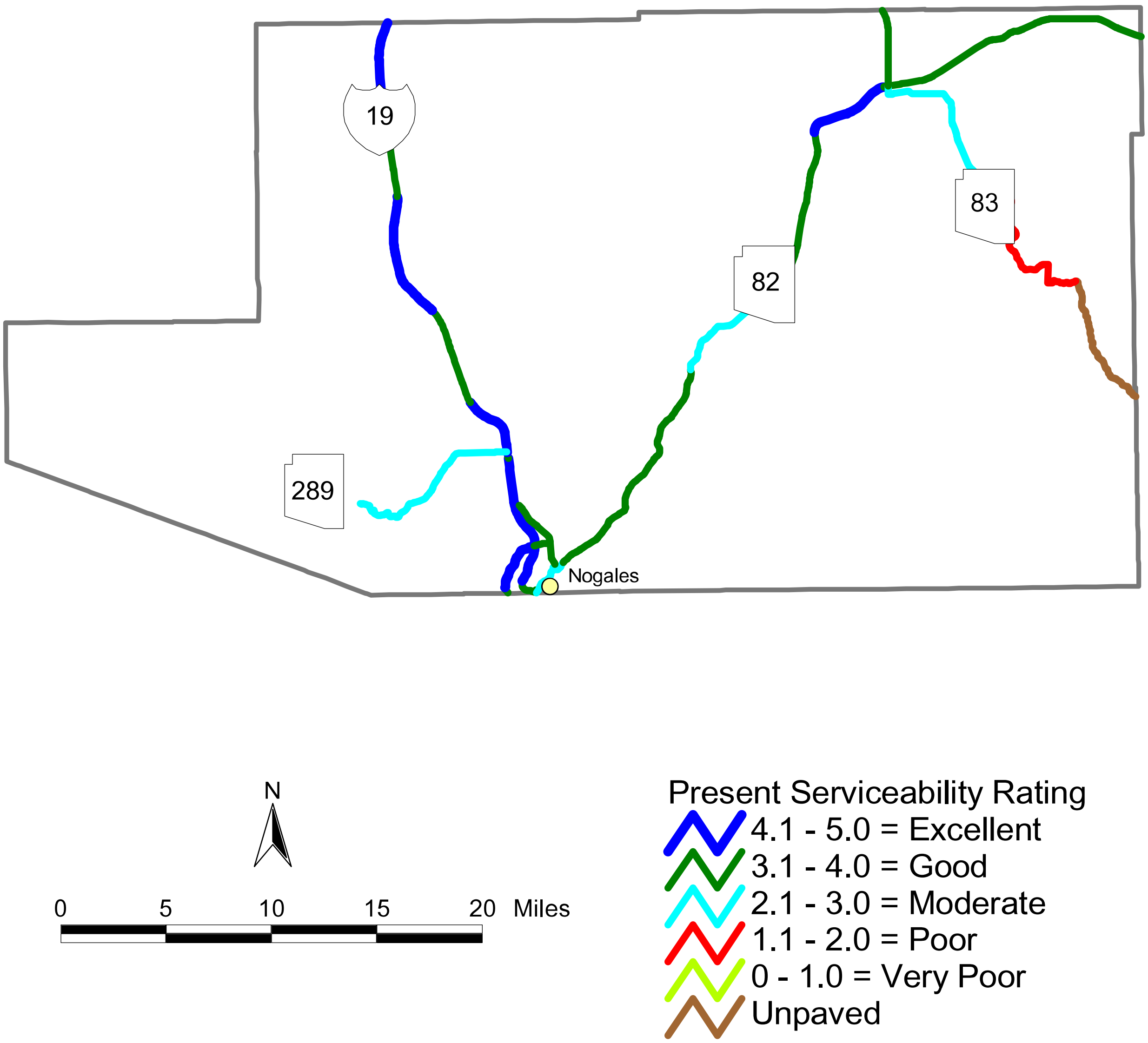
INSET
ROAD CONDITIONS IN THE TUCSON METROPOLITAN AREA



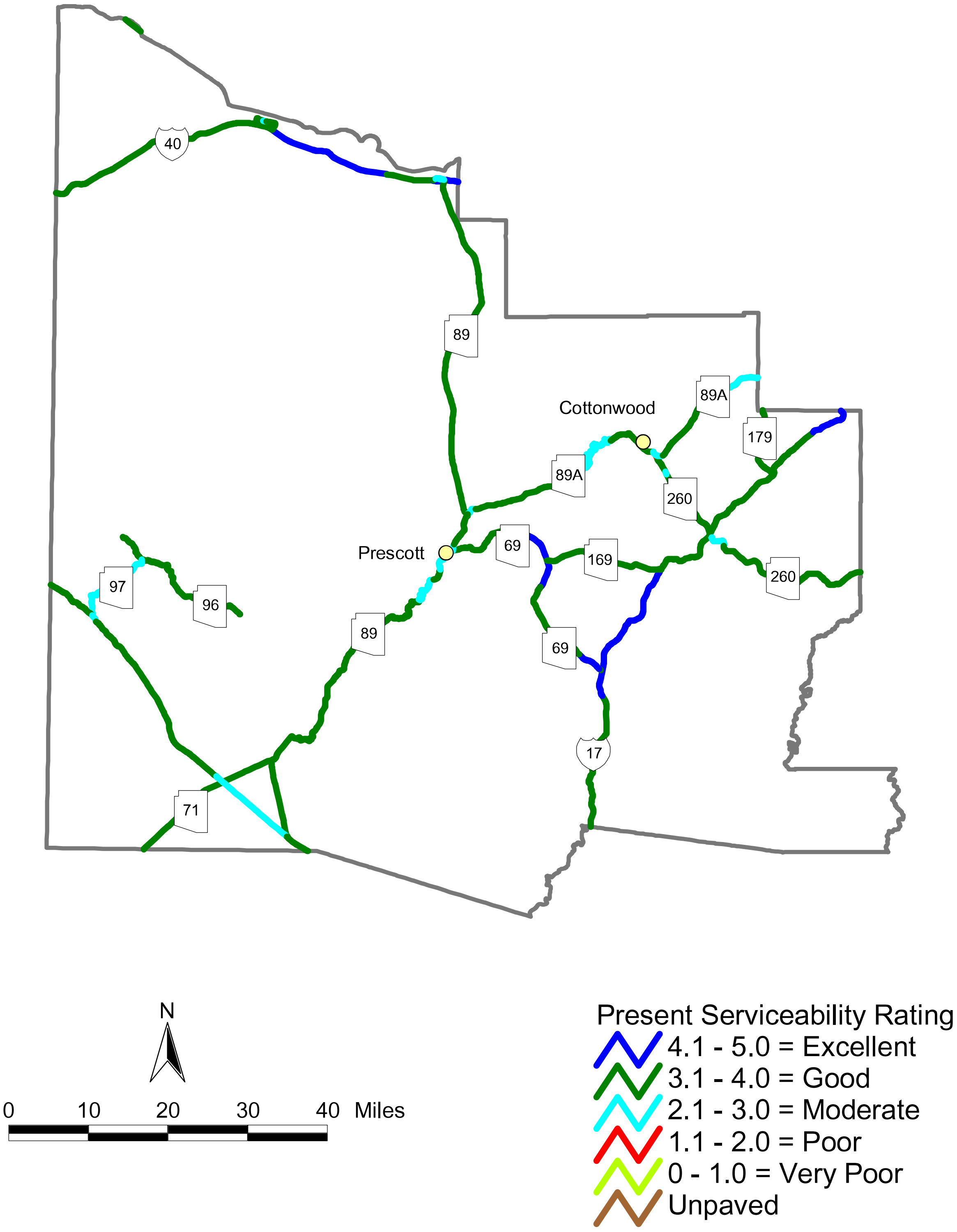
ROAD CONDITIONS IN PINAL COUNTY



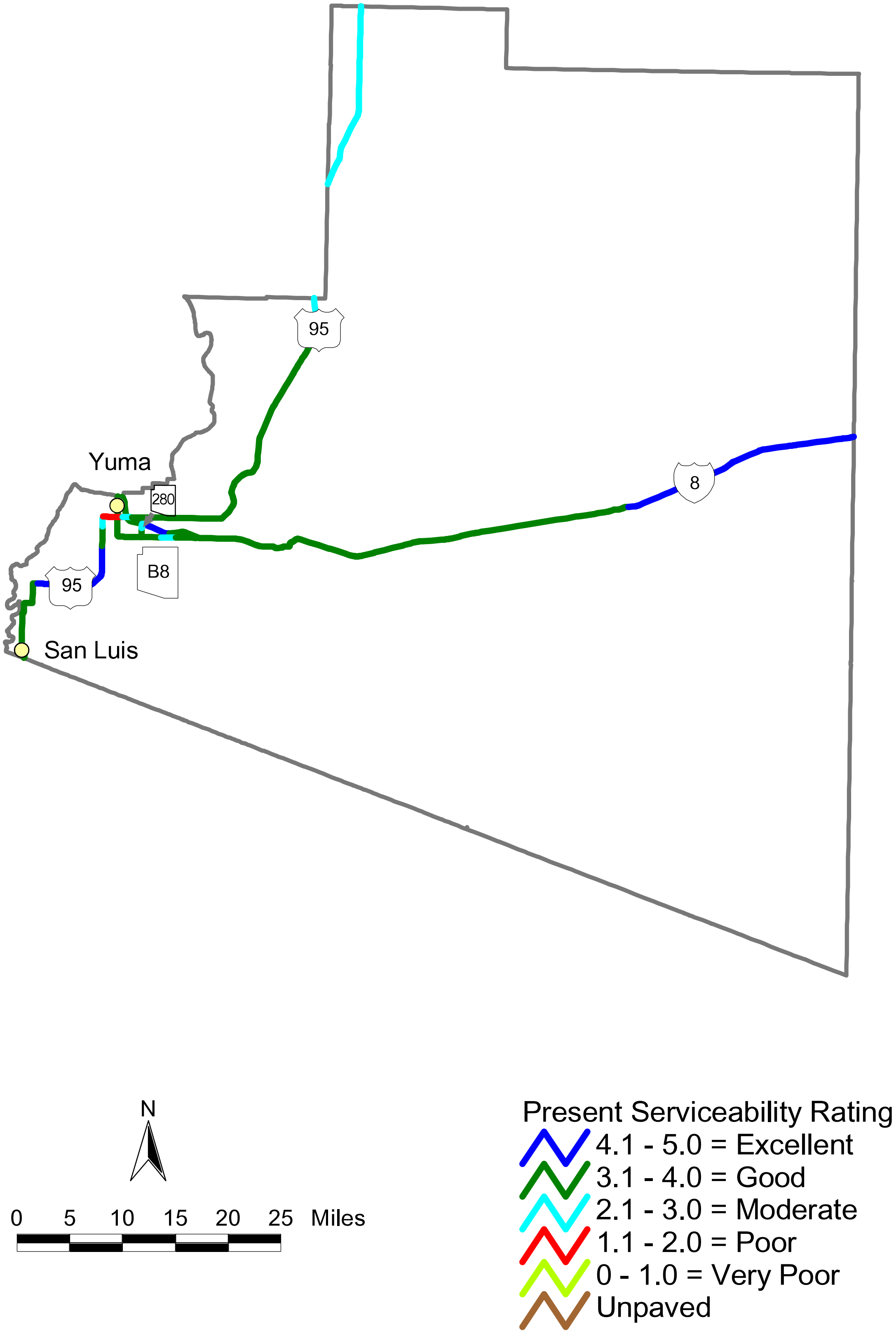
ROAD CONDITIONS IN SANTA CRUZ COUNTY



ROAD CONDITIONS IN YAVAPAI COUNTY



ROAD CONDITIONS IN YUMA COUNTY

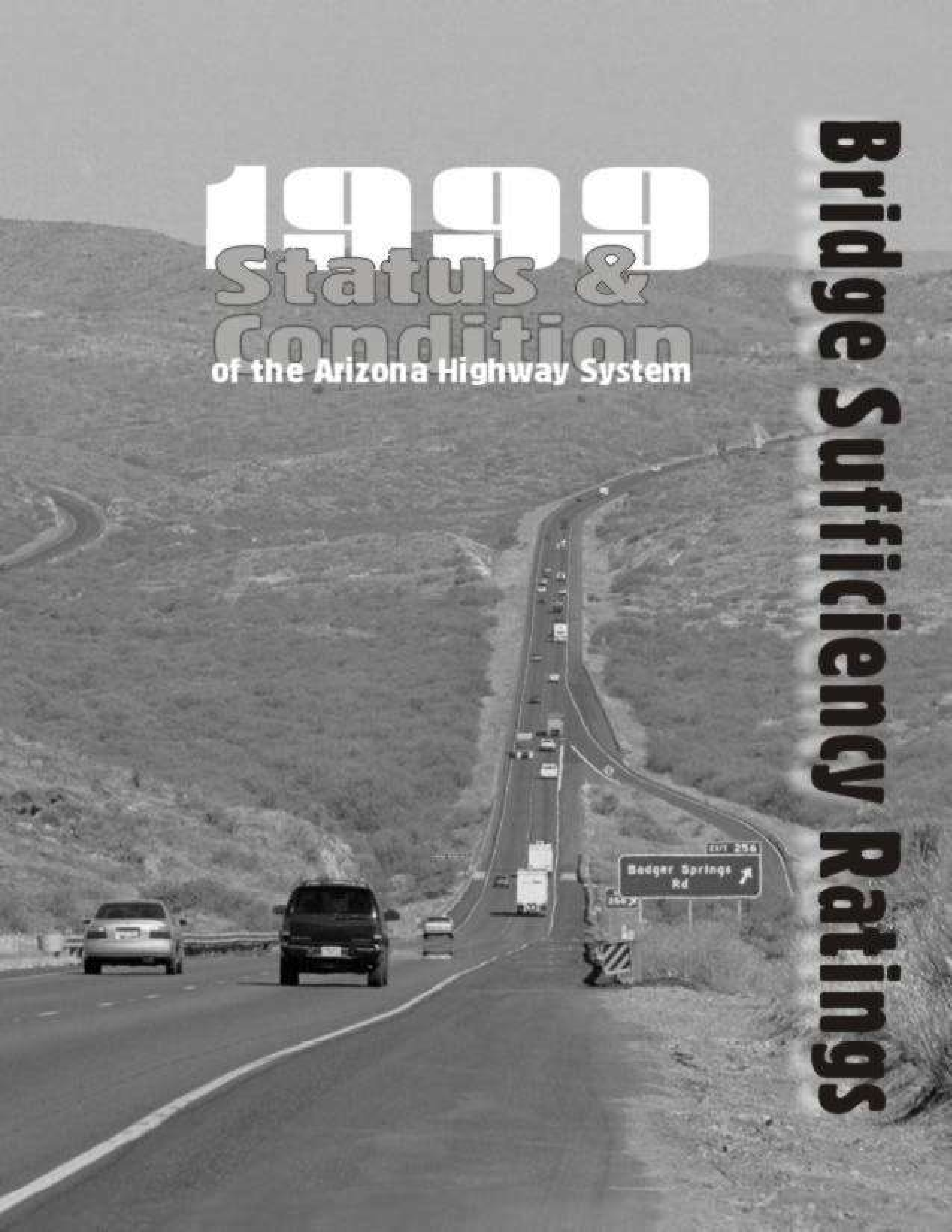


1999

Status & Condition

of the Arizona Highway System

Bridge Sufficiency Ratings



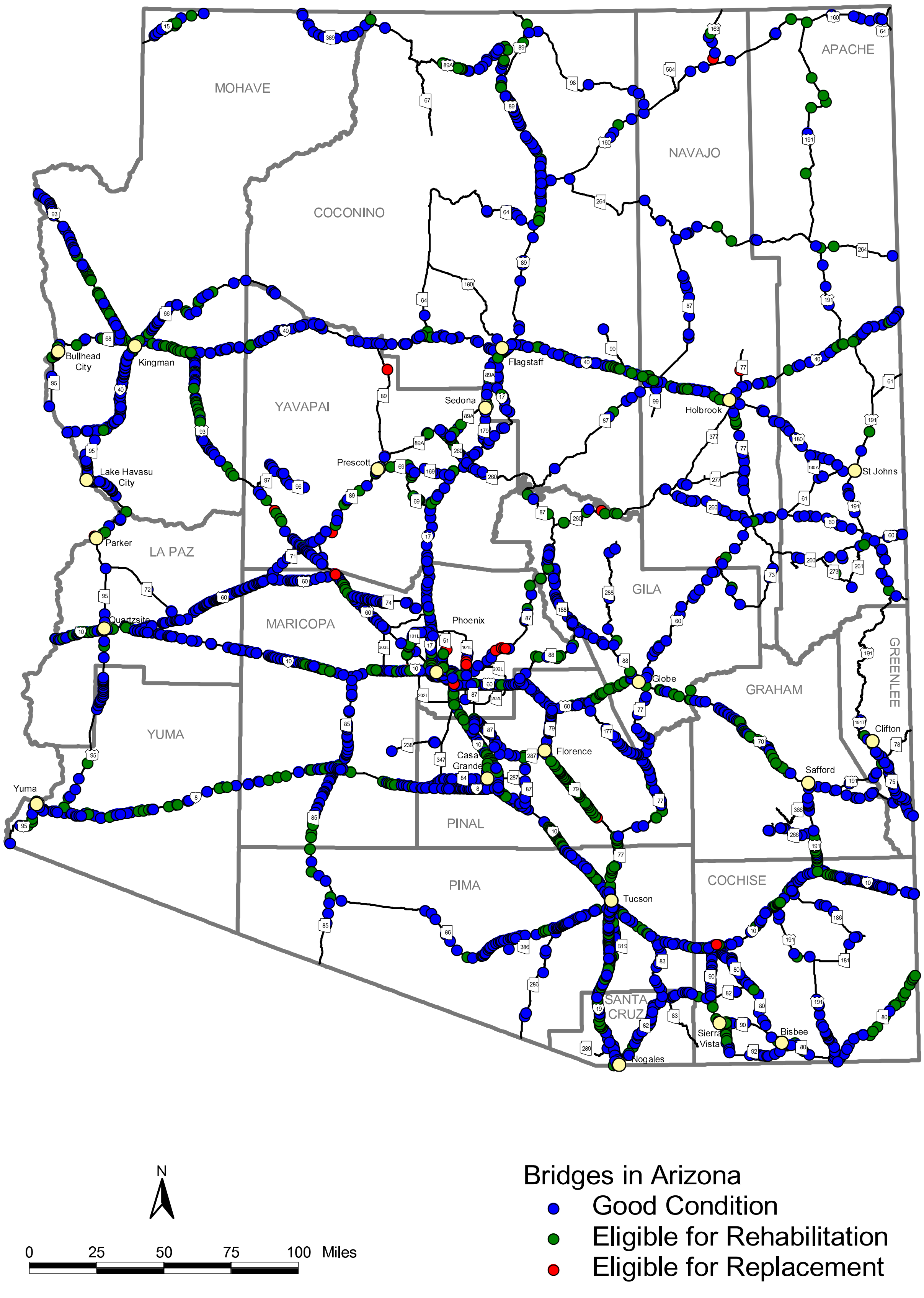
Bridge Sufficiency Rating

Bridges are assigned a Sufficiency Rating based on the Structural Inventory and Appraisal (SA&I) form. This form contains information on bridge type, geometry, clearances, load rating, and traffic. The information on this form is used to develop the Bridge Sufficiency Rating (BSR) for each structure. Additionally, a notation is made on the form as to whether the bridge is functionally obsolete or structurally deficient. The BSR is used to categorize bridge needs as follows:

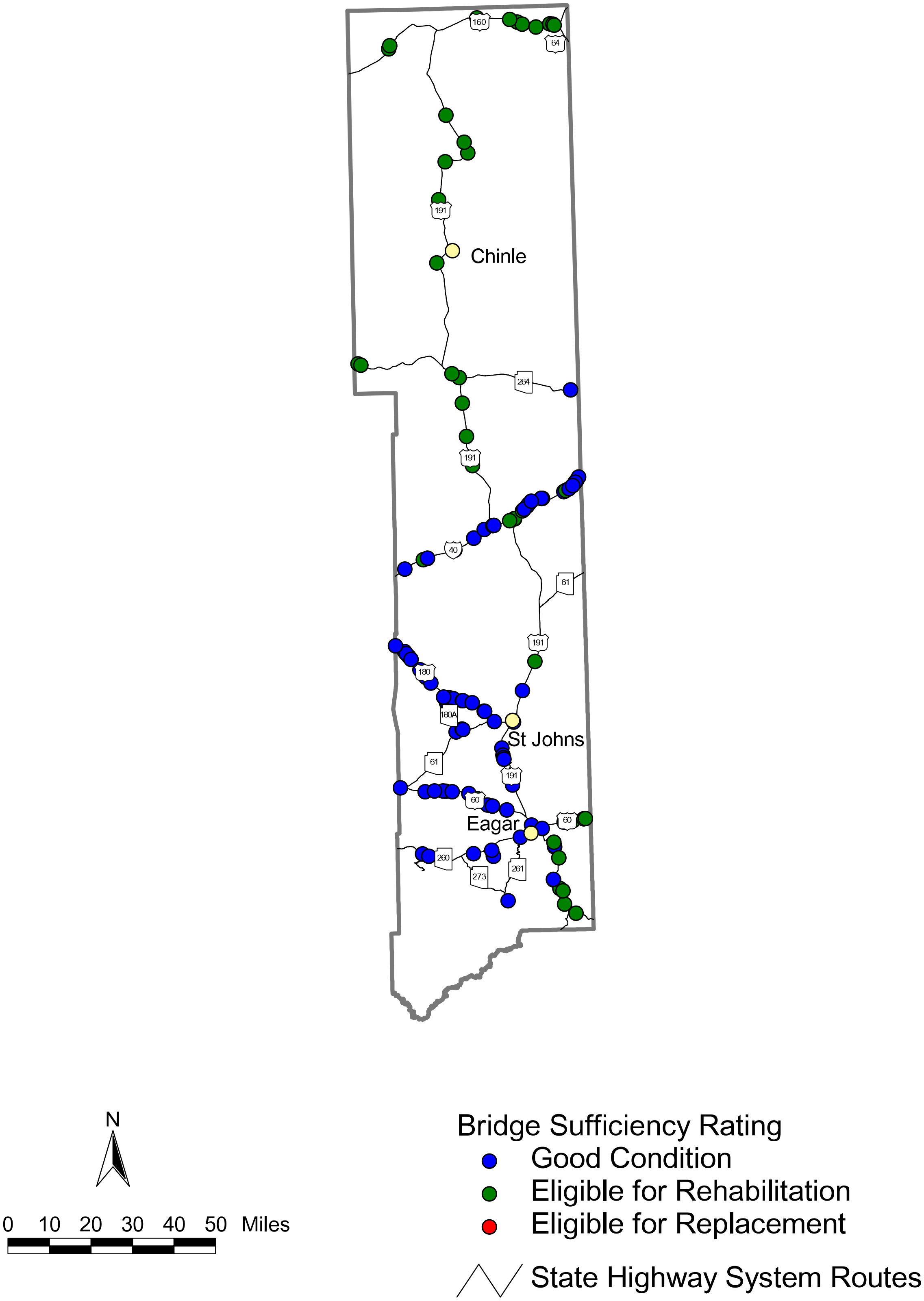
BSR	Category
> 80	Good Condition
50 - 80	Eligible for rehabilitation
< 50	Eligible for replacement

The BSR data is mapped at the county level and inserts are used where appropriate.

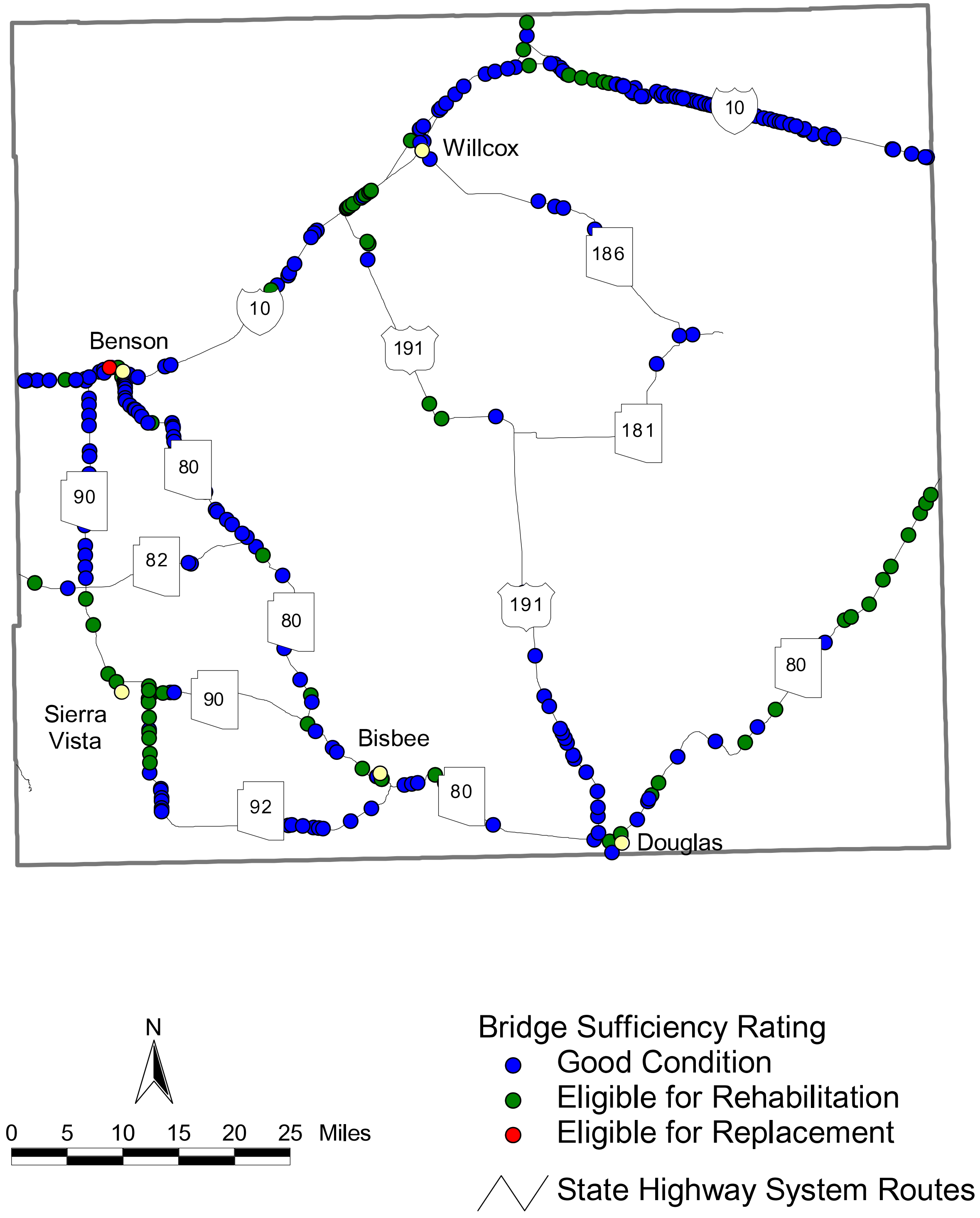
1999 BRIDGES ON THE ARIZONA STATE HIGHWAY SYSTEM



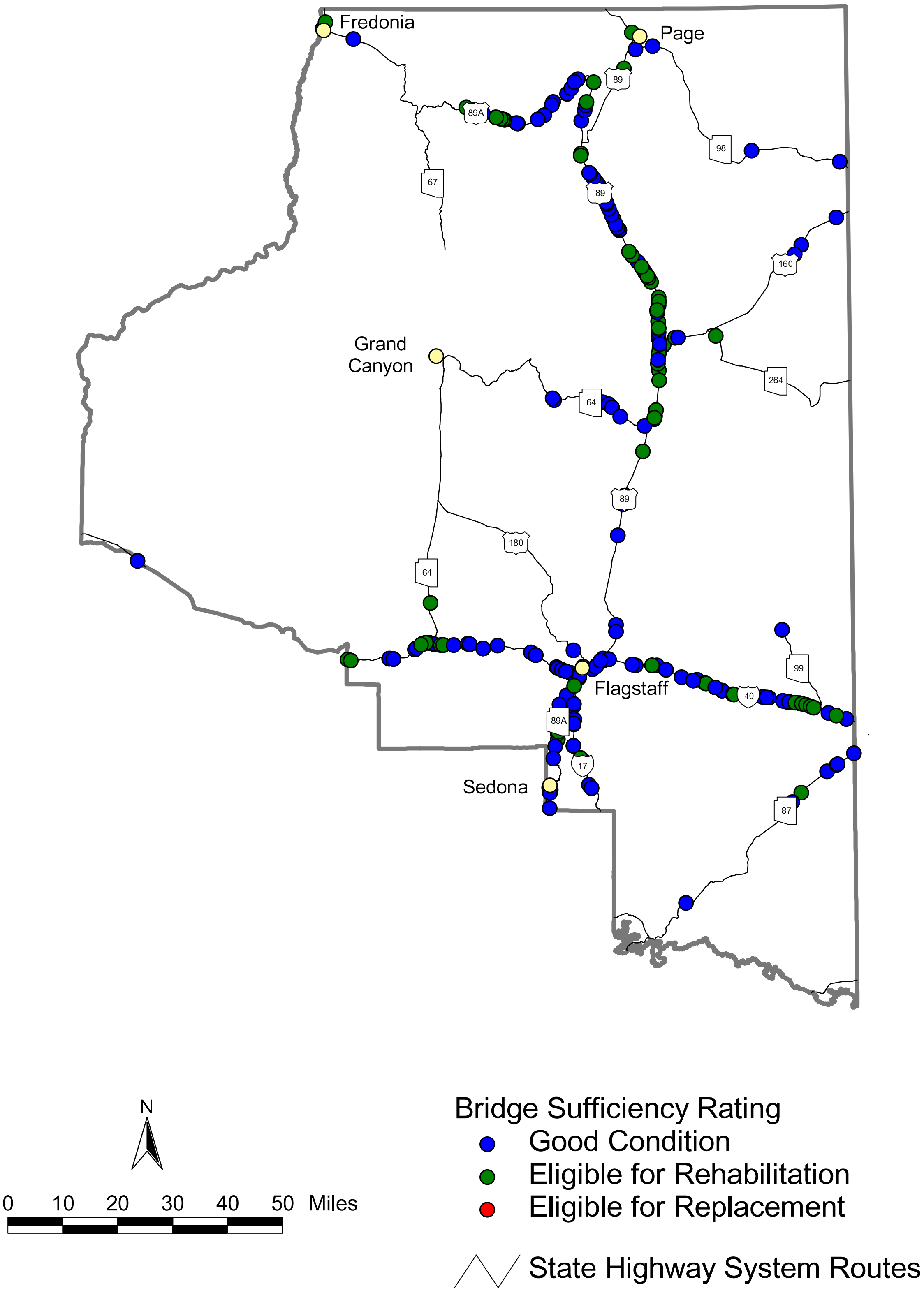
BRIDGE SUFFICIENCY RATING IN APACHE COUNTY



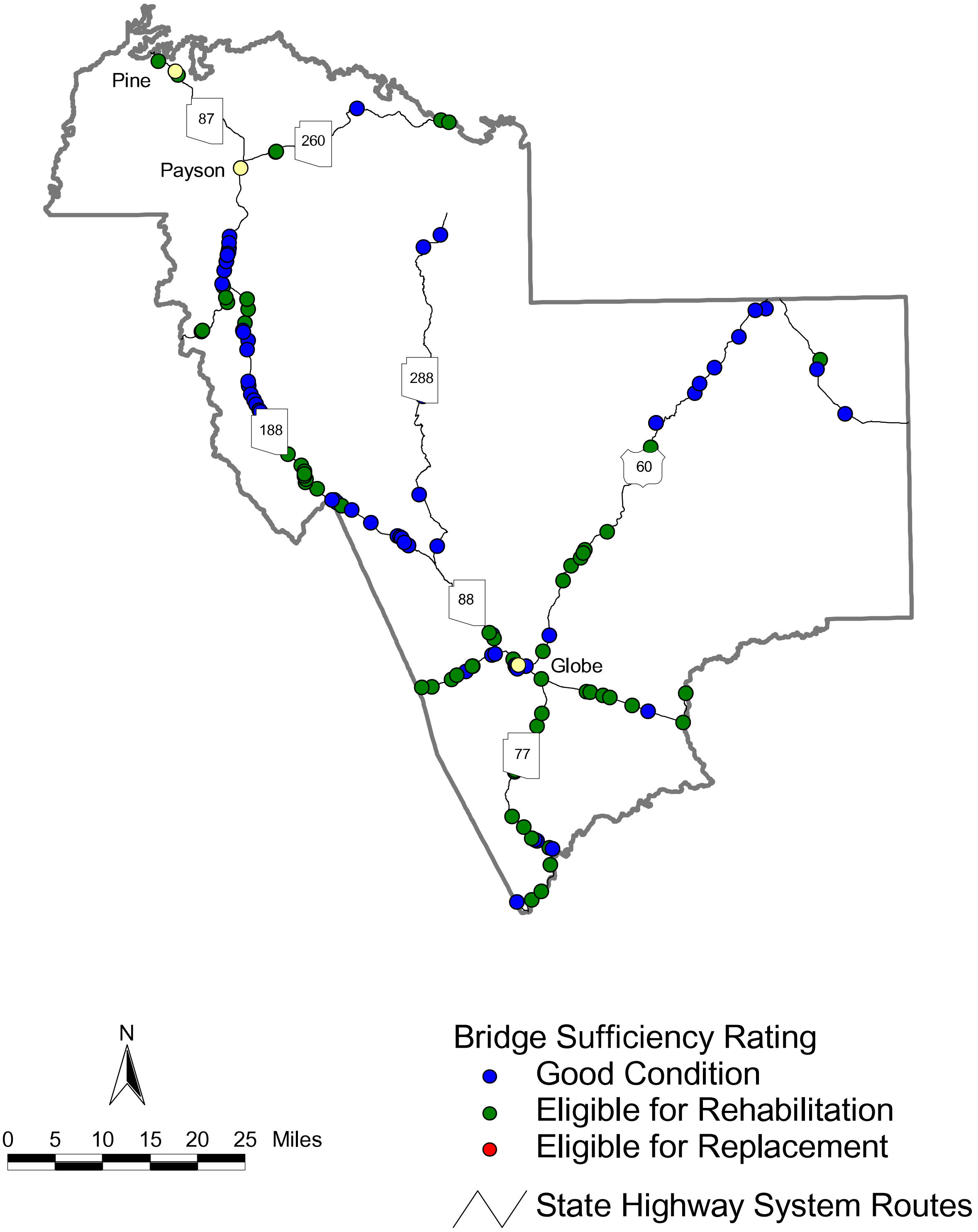
BRIDGE SUFFICIENCY RATING IN COCHISE COUNTY



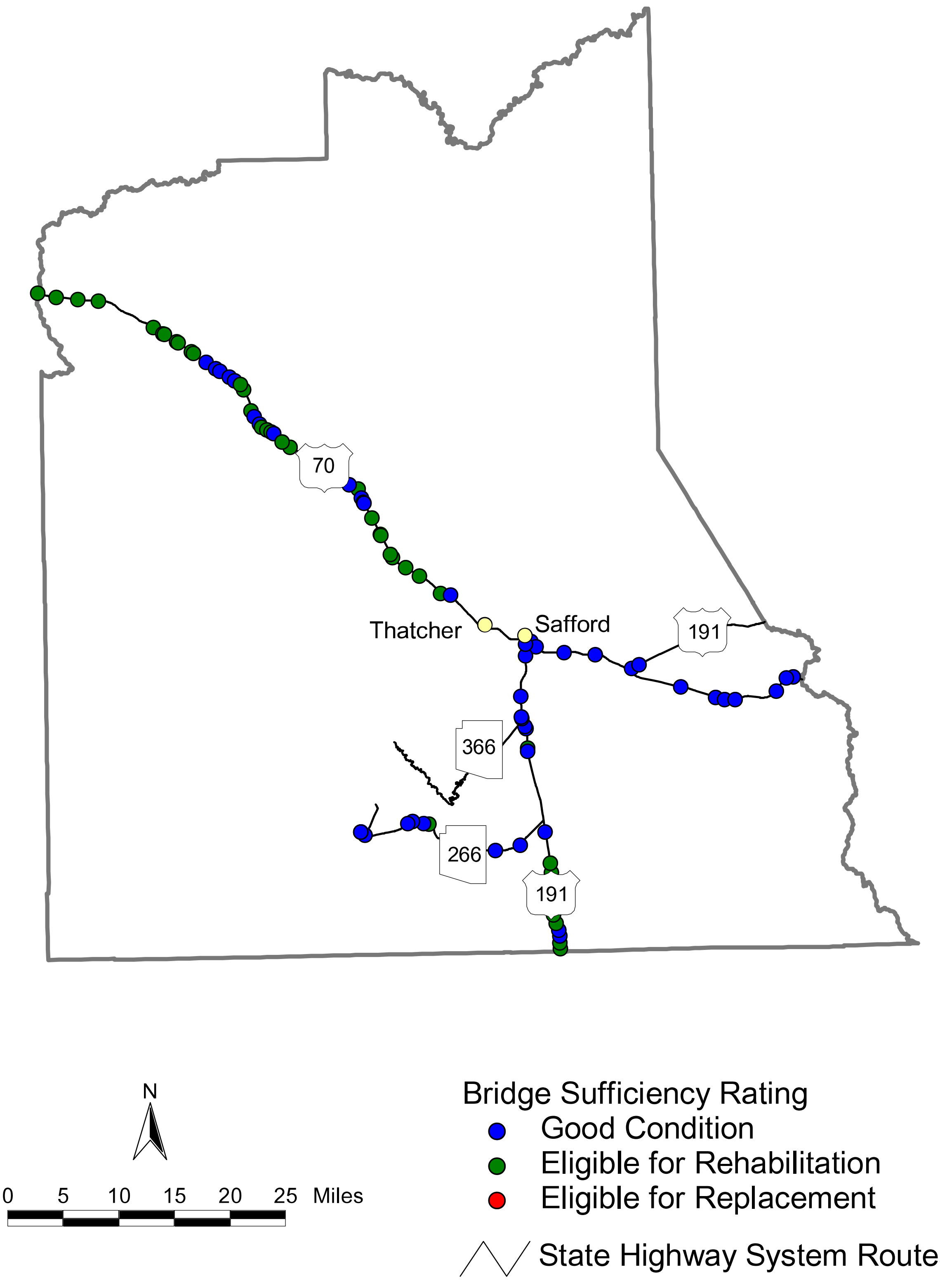
BRIDGE SUFFICIENCY RATING IN COCONINO COUNTY



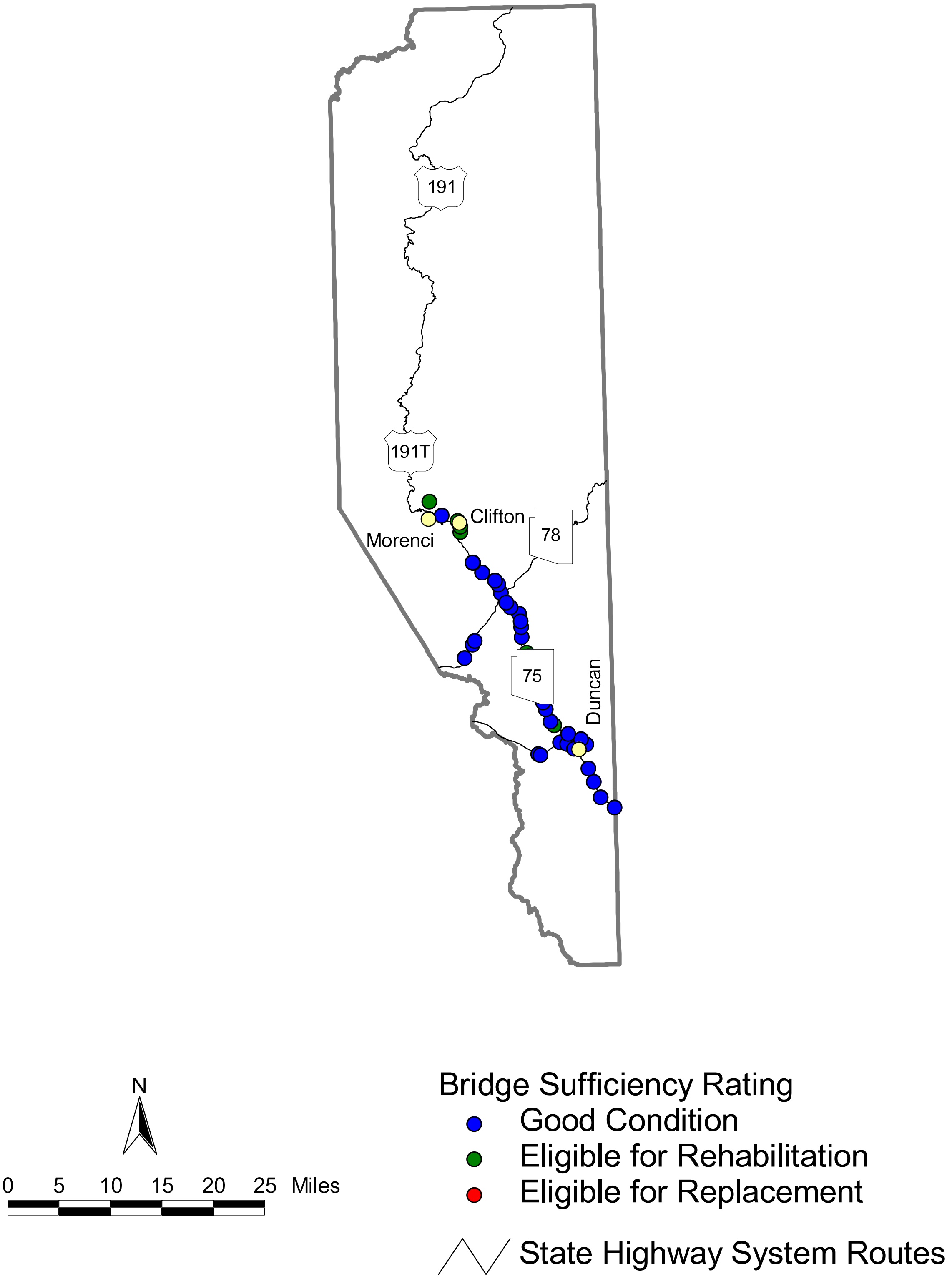
BRIDGE SUFFICIENCY RATING IN GILA COUNTY


Pine
87
260
Payson
288
188
60
88
Globe
77
N
0
5
10
15
20
25
Miles
Bridge Sufficiency Rating
● Good Condition
● Eligible for Rehabilitation
● Eligible for Replacement
State Highway System Routes

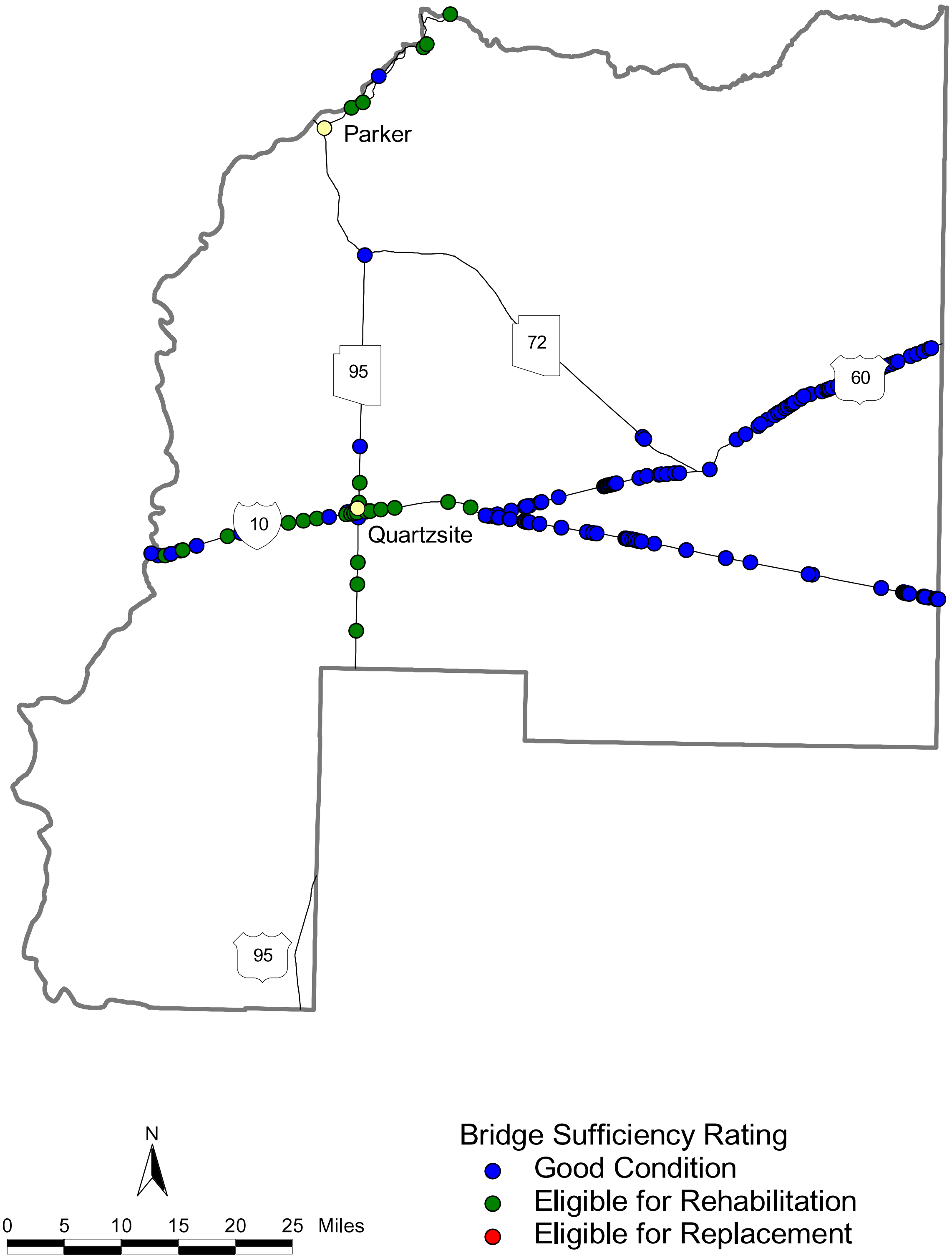
BRIDGE SUFFICIENCY RATING IN GRAHAM COUNTY



BRIDGE SUFFICIENCY RATING IN GREENLEE COUNTY



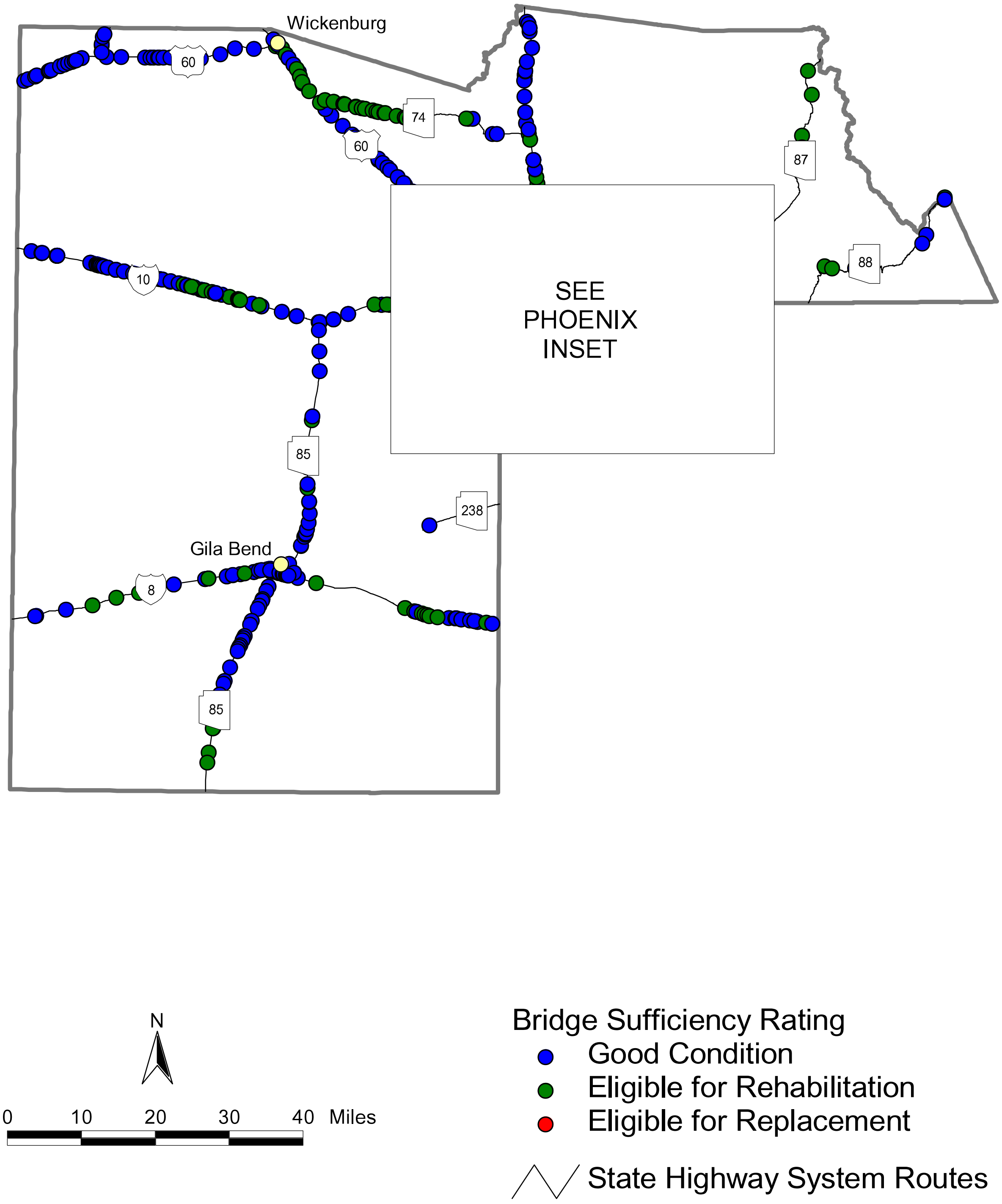
BRIDGE SUFFICIENCY RATING IN LA PAZ COUNTY



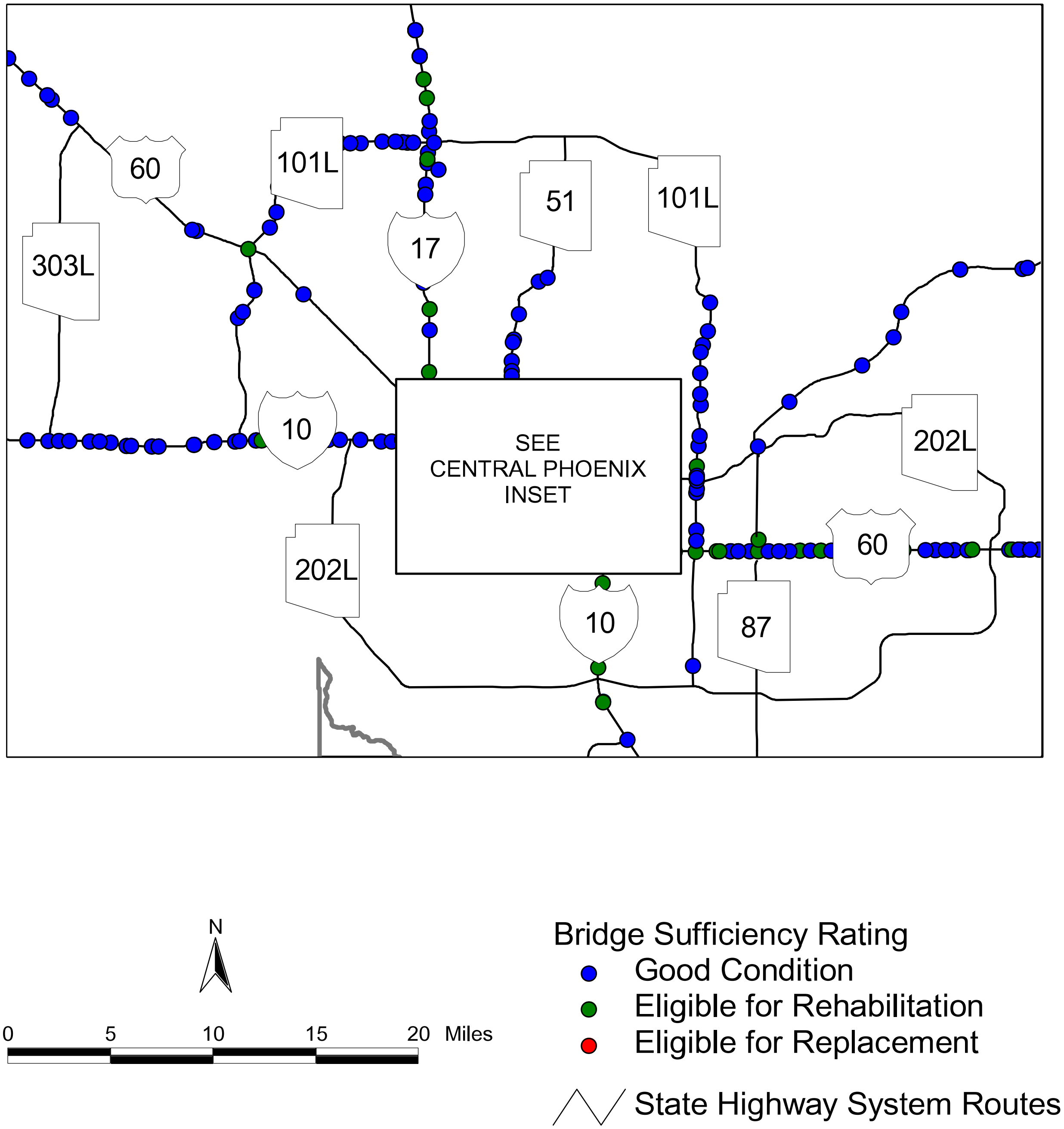
Bridge Sufficiency Rating
- 🔵 Good Condition
- 🟢 Eligible for Rehabilitation
- 🔴 Eligible for Replacement

╱╲╱ State Highway System Routes

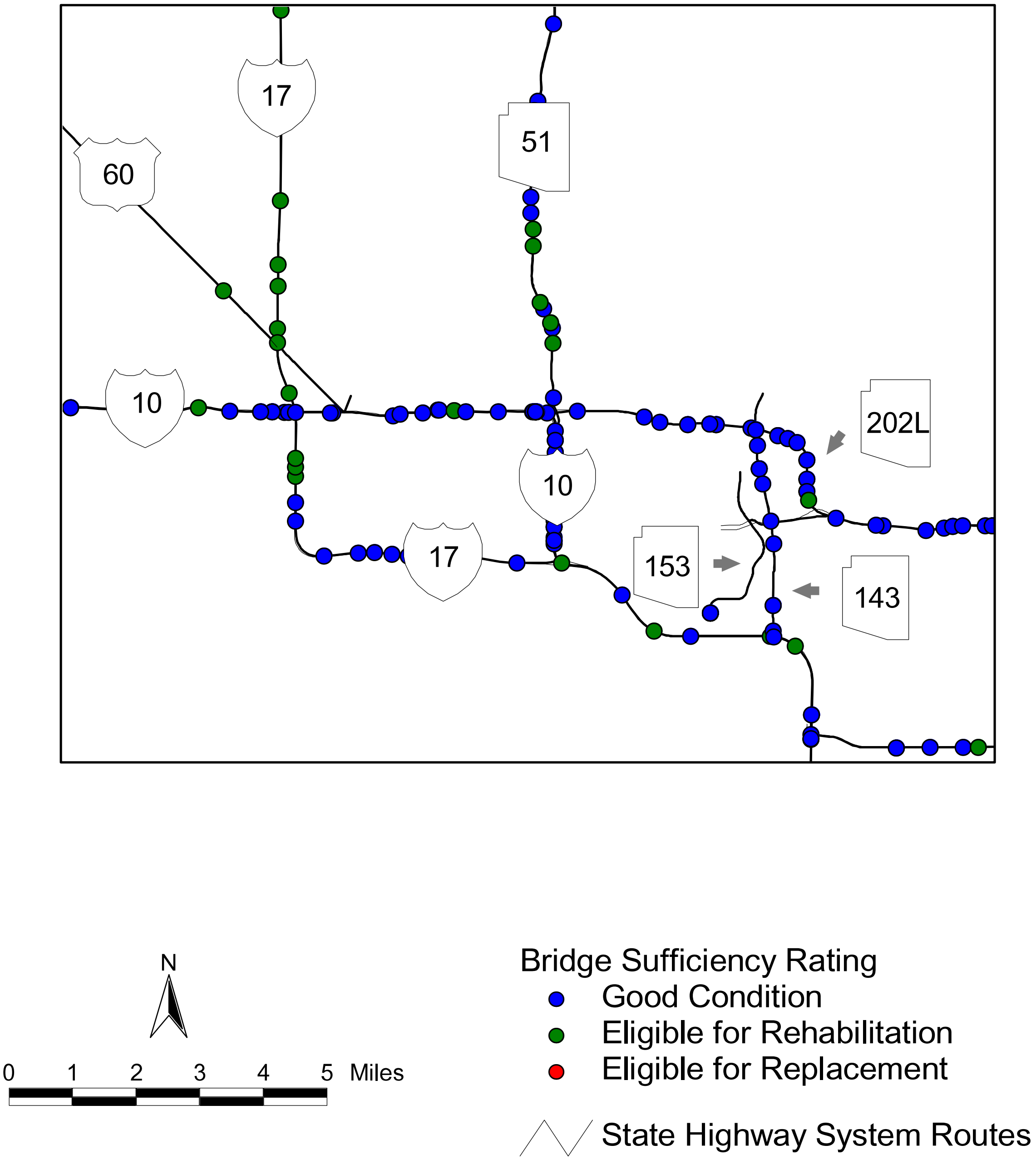
BRIDGE SUFFICIENCY RATING IN MARICOPA COUNTY


Wickenburg
60
74
60
87
88
10
SEE PHOENIX INSET
85
238
Gila Bend
8
85
N
0
10
20
30
40
Miles
Bridge Sufficiency Rating
● Good Condition
● Eligible for Rehabilitation
● Eligible for Replacement
State Highway System Routes

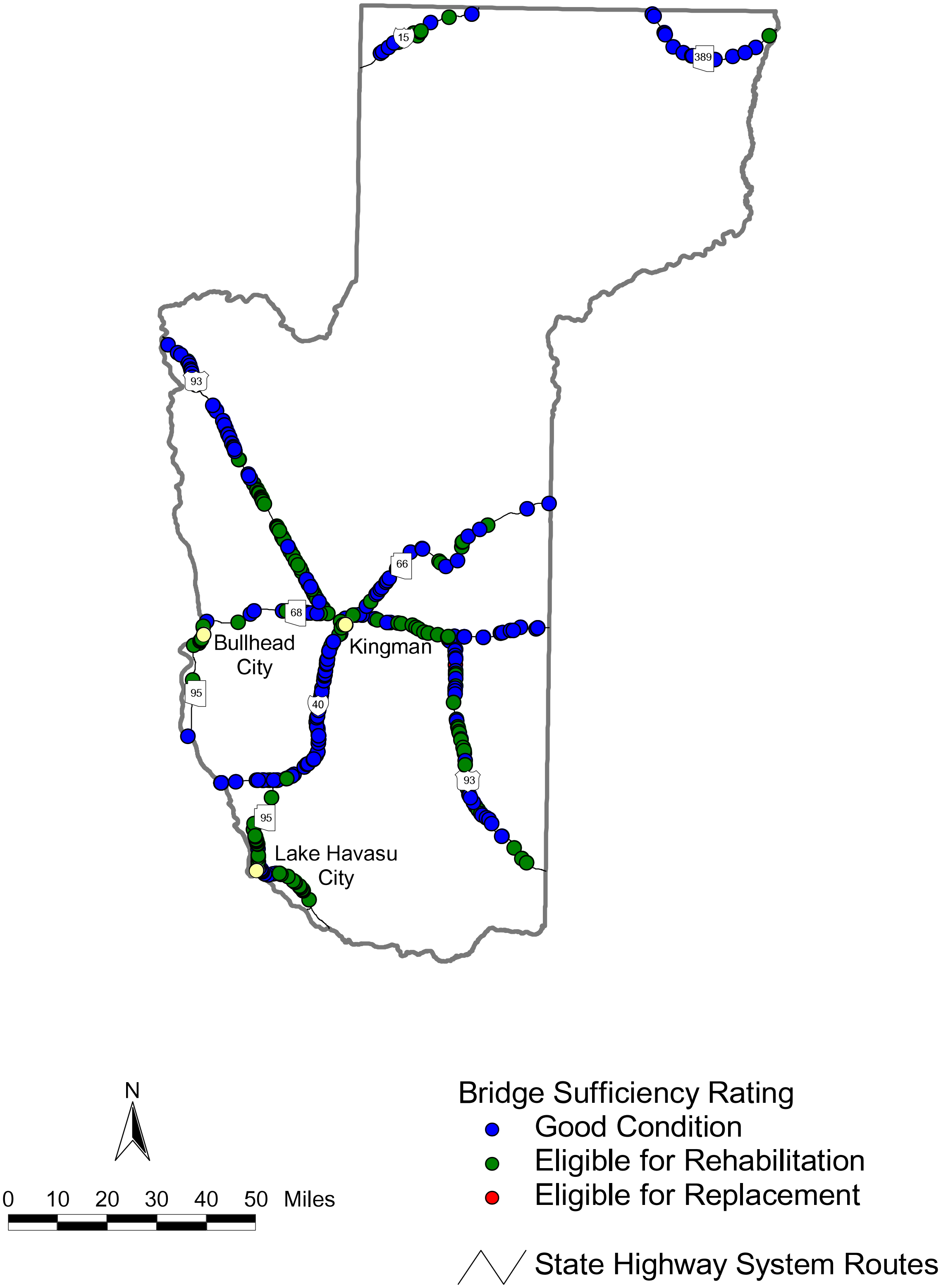
INSET
BRIDGE SUFFICIENCY RATING IN THE PHOENIX METROPOLITAN AREA


60
101L
17
51
101L
303L
10
SEE
CENTRAL PHOENIX
INSET
202L
202L
60
10
87
N
0
5
10
15
20
Miles
Bridge Sufficiency Rating
● Good Condition
● Eligible for Rehabilitation
● Eligible for Replacement
State Highway System Routes

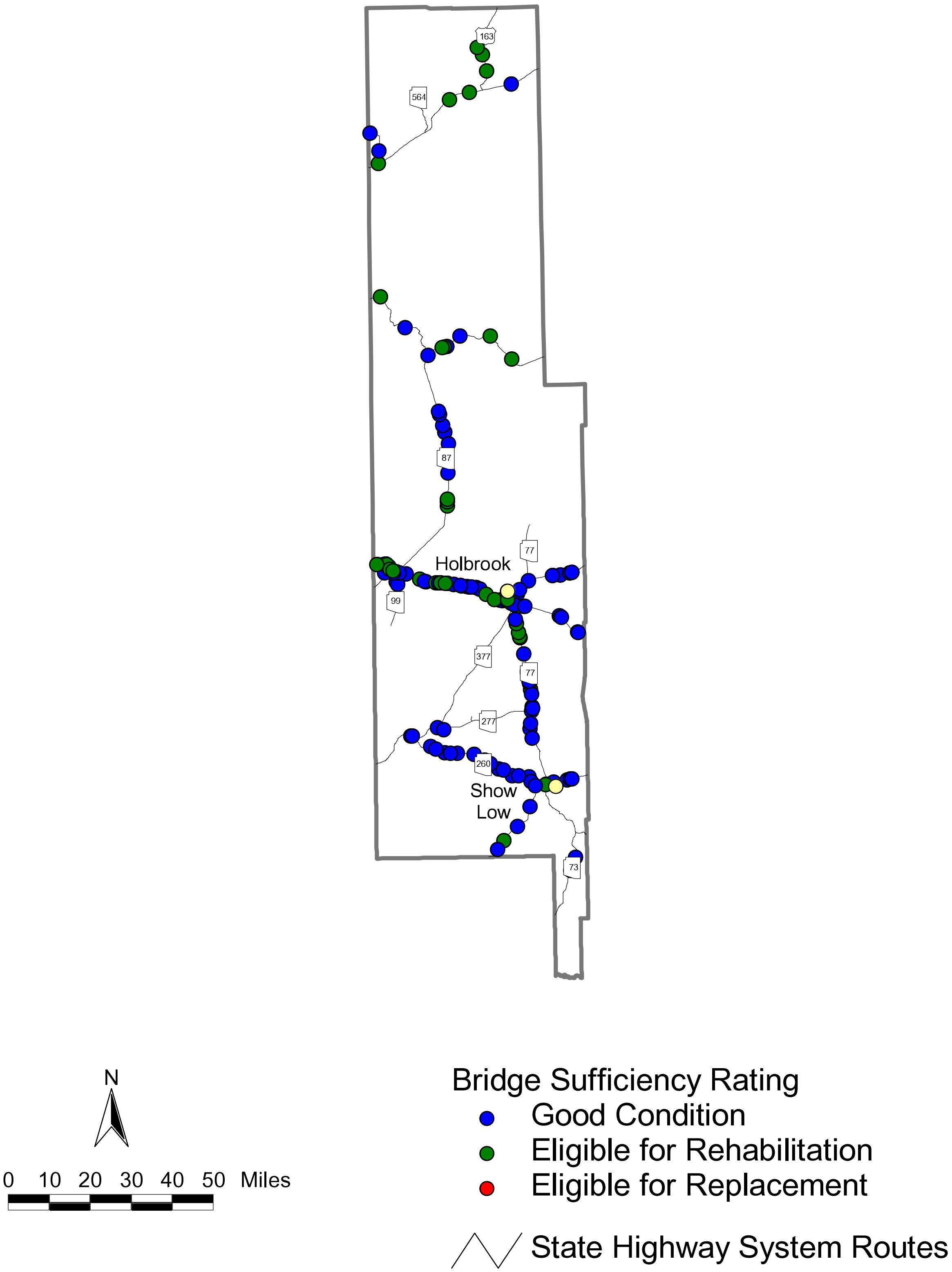
INSET
BRIDGE SUFFICIENCY RATING IN CENTRAL PHOENIX


17
51
60
10
10
17
202L
153
143
N
0
1
2
3
4
5
Miles
Bridge Sufficiency Rating
Good Condition
Eligible for Rehabilitation
Eligible for Replacement
State Highway System Routes

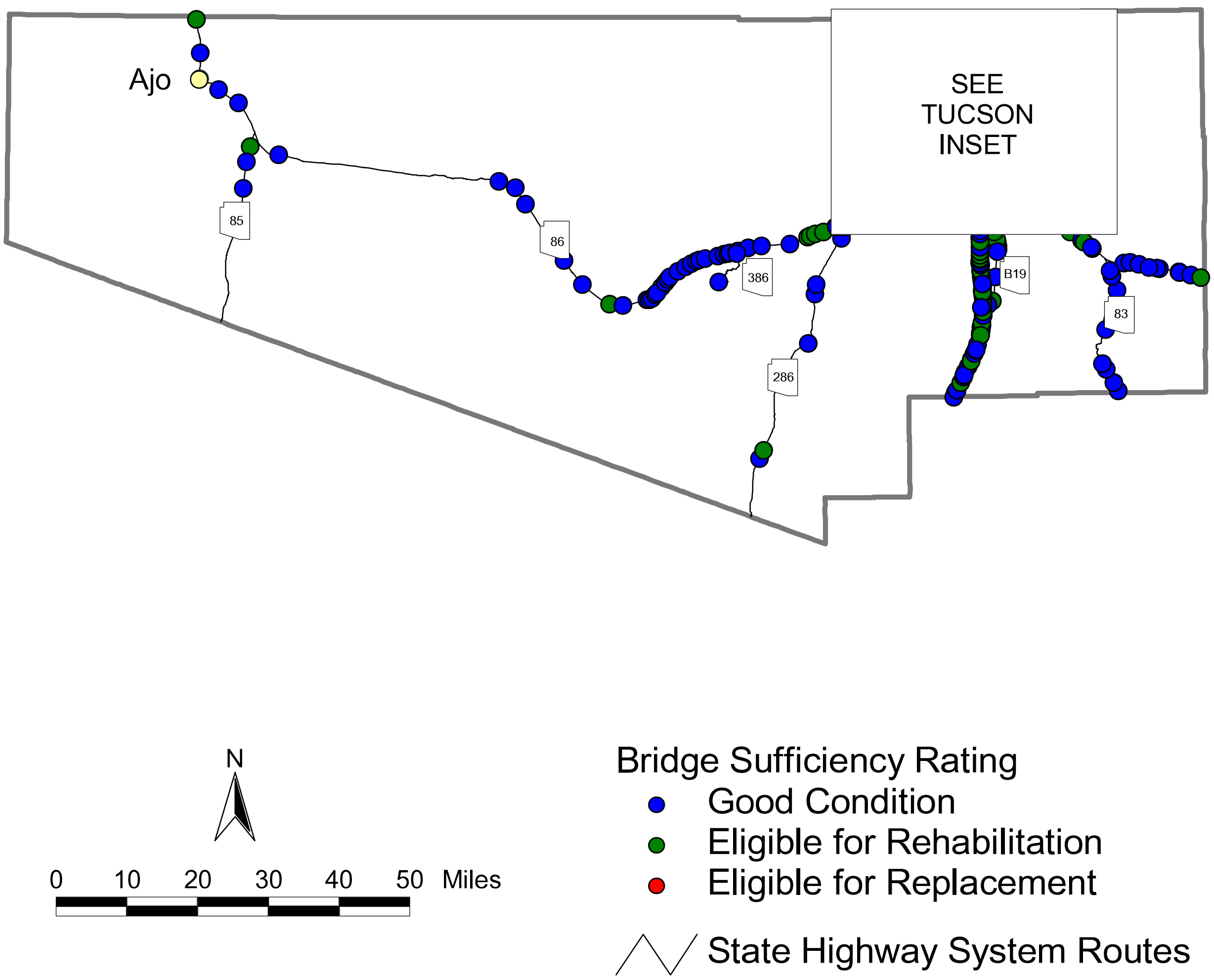
BRIDGE SUFFICIENCY RATING IN MOHAVE COUNTY



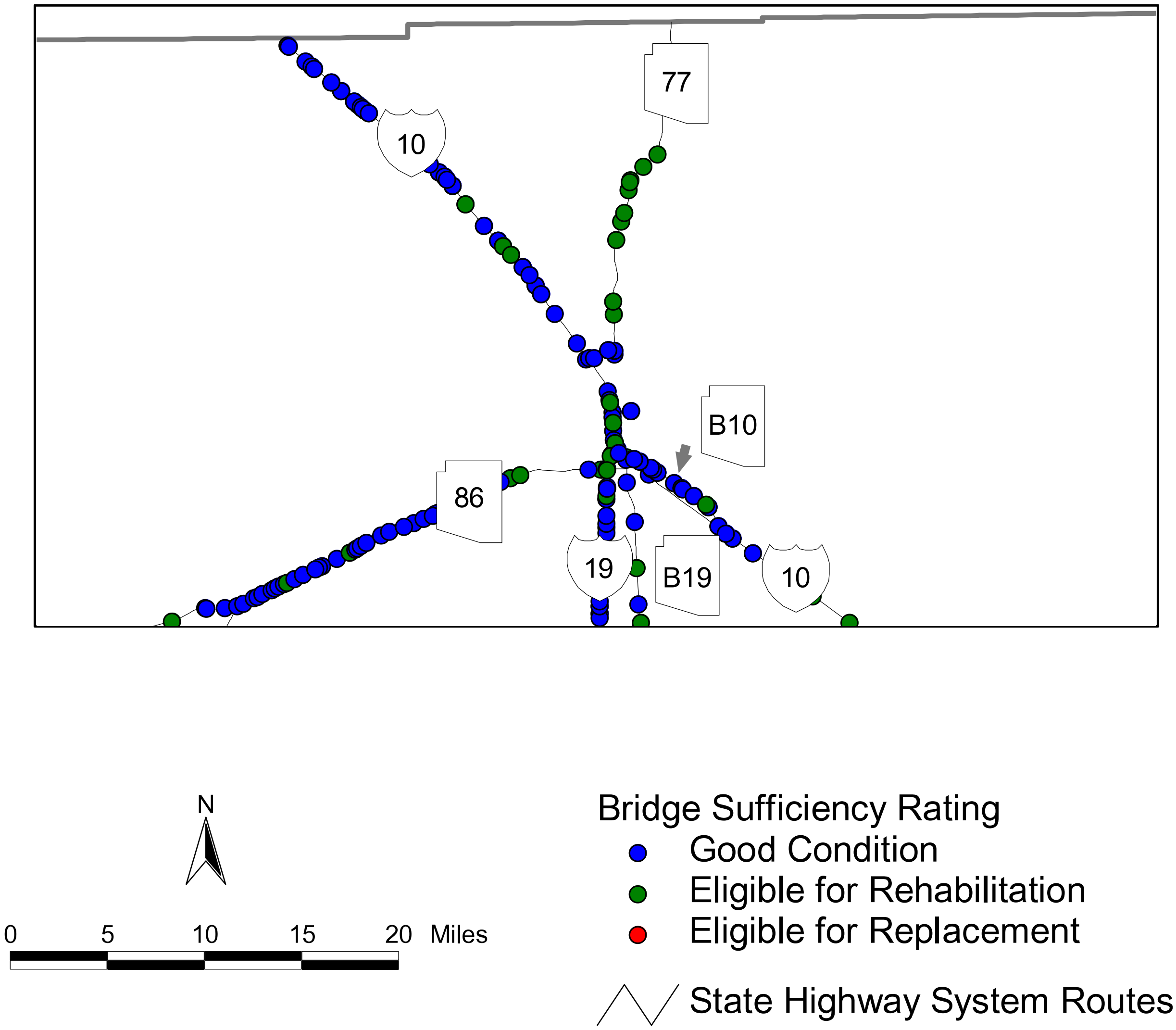
BRIDGE SUFFICIENCY RATING IN NAVAJO COUNTY



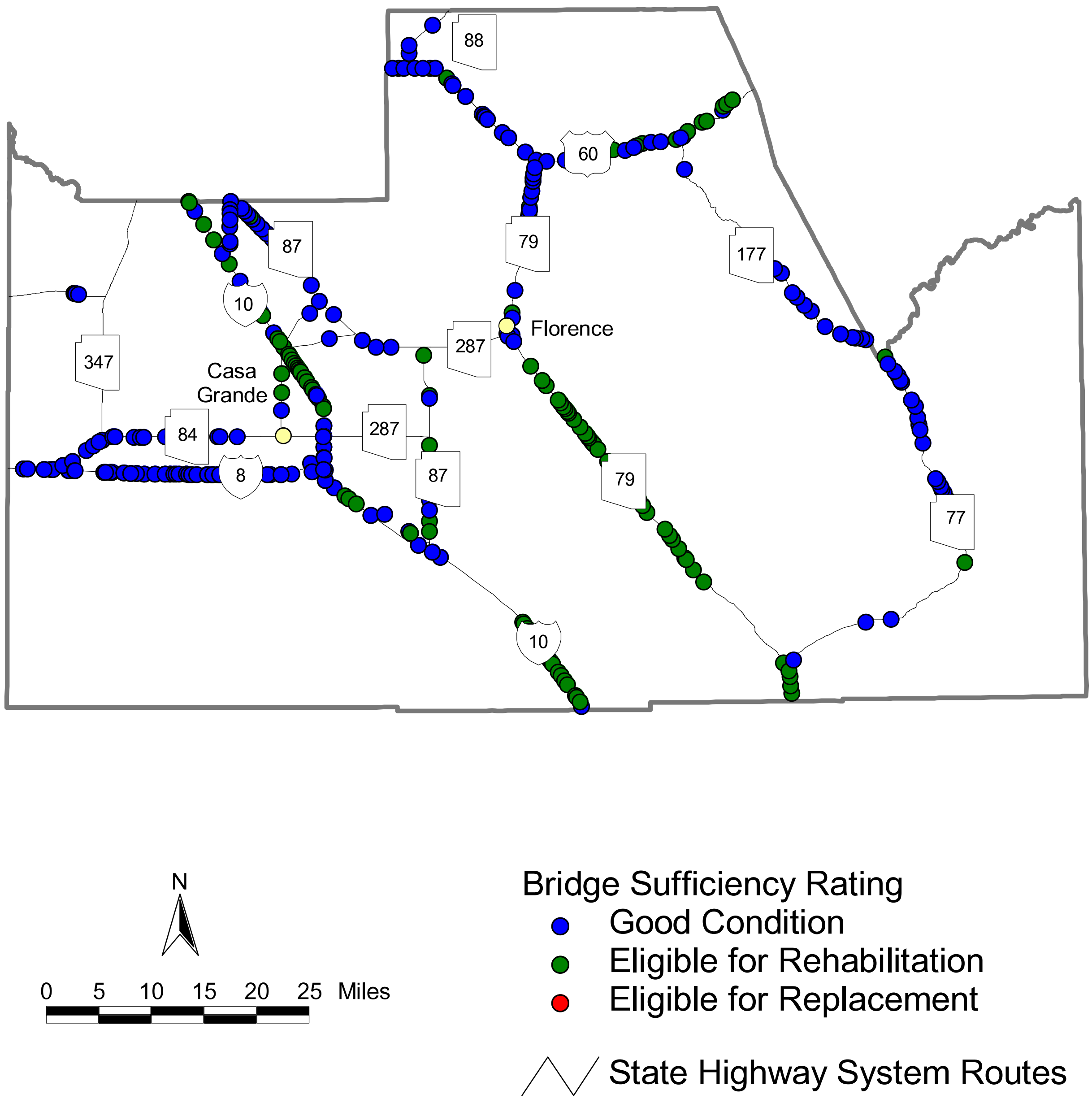
BRIDGE SUFFICIENCY RATING IN PIMA COUNTY


Ajo
SEE TUCSON INSET
85
86
386
286
B19
83
N
0
10
20
30
40
50
Miles
Bridge Sufficiency Rating
● Good Condition
● Eligible for Rehabilitation
● Eligible for Replacement
State Highway System Routes

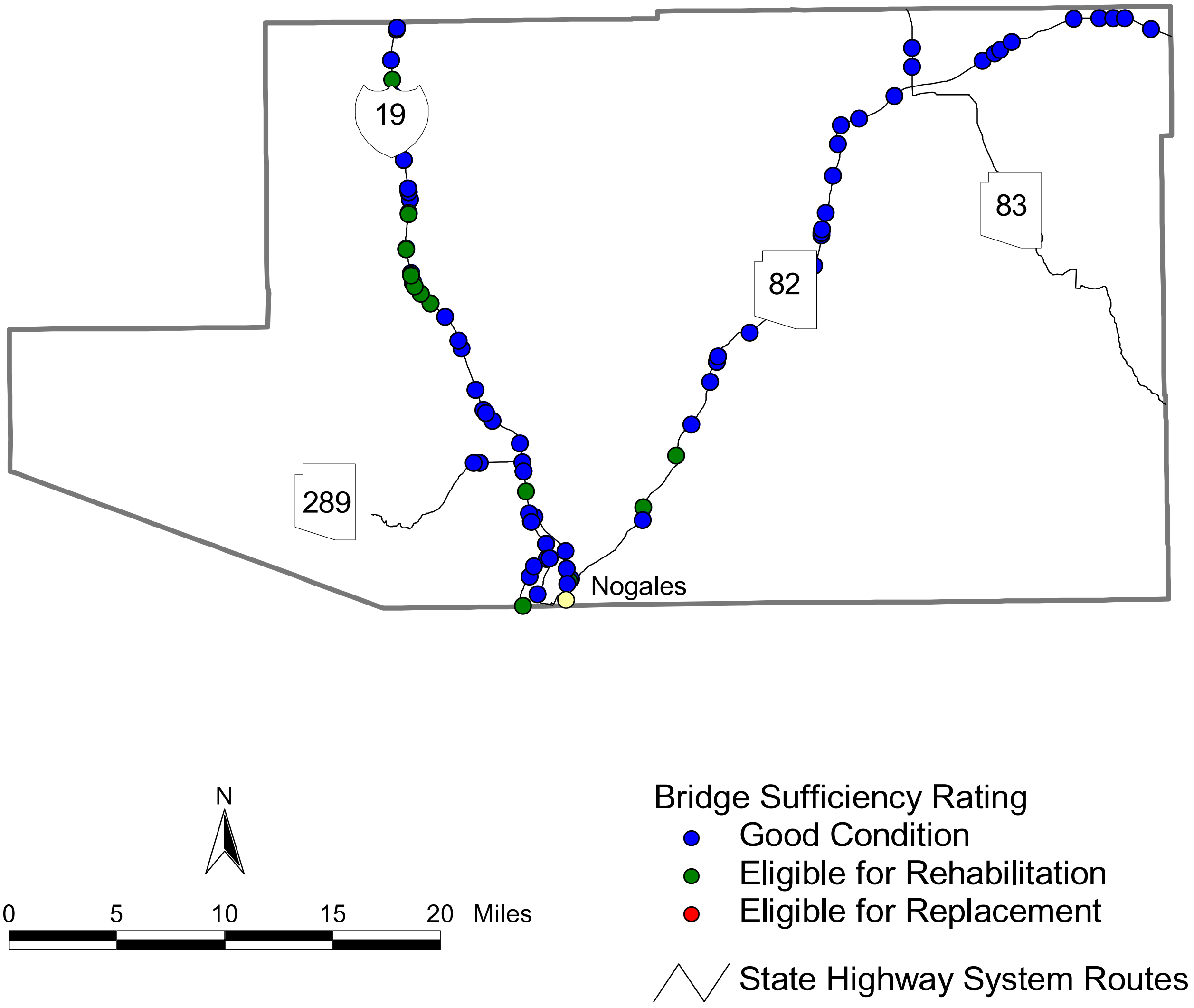
INSET
BRIDGE SUFFICIENCY RATING IN THE TUCSON METROPOLITAN AREA


77
10
B10
86
19
B19
10
N
0
5
10
15
20
Miles
Bridge Sufficiency Rating
Good Condition
Eligible for Rehabilitation
Eligible for Replacement
State Highway System Routes

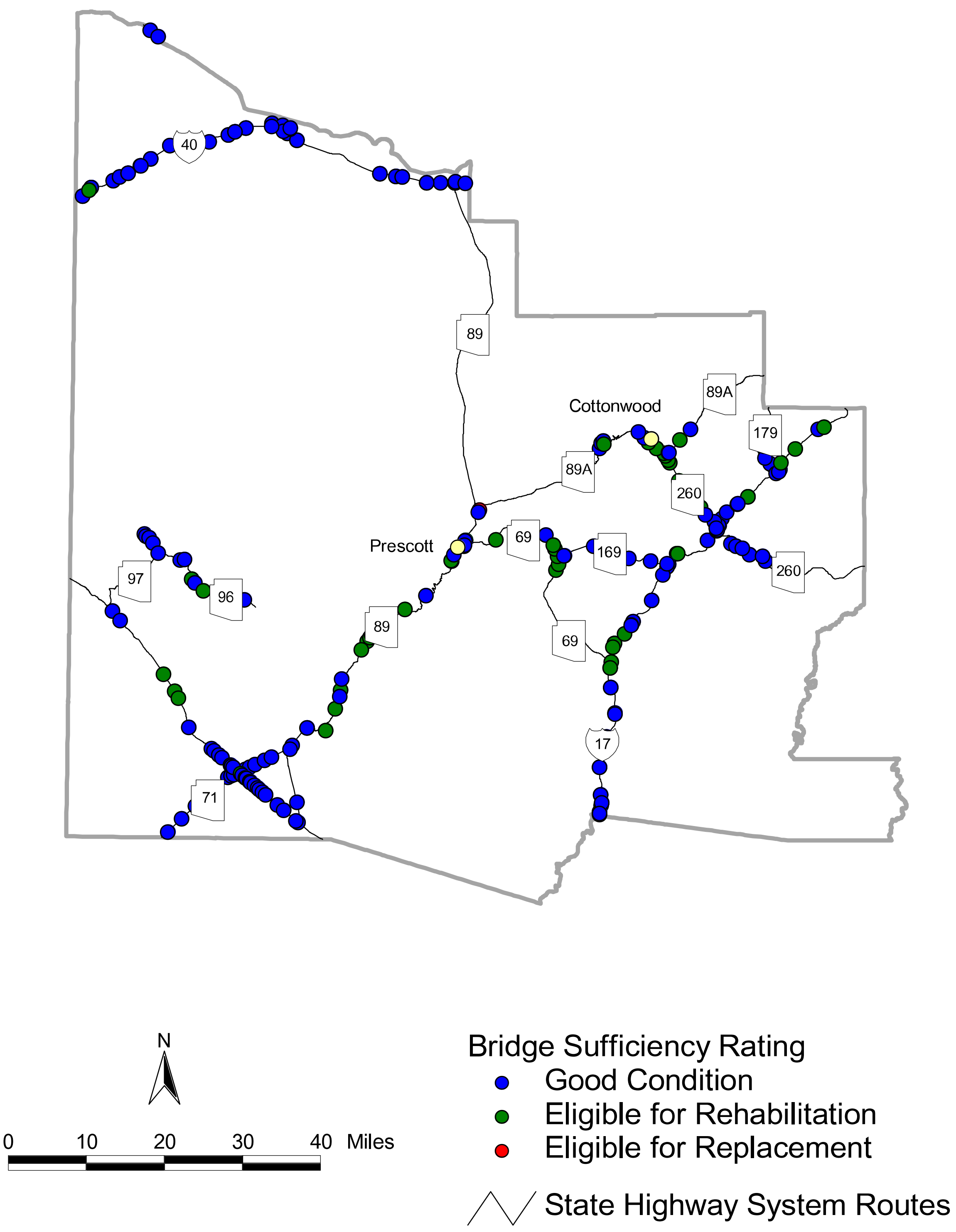
BRIDGE SUFFICIENCY RATING IN PINAL COUNTY


88
60
87
79
177
10
347
287
Florence
Casa Grande
84
8
287
87
79
77
10
N
0 5 10 15 20 25 Miles
Bridge Sufficiency Rating
● Good Condition
● Eligible for Rehabilitation
● Eligible for Replacement
State Highway System Routes

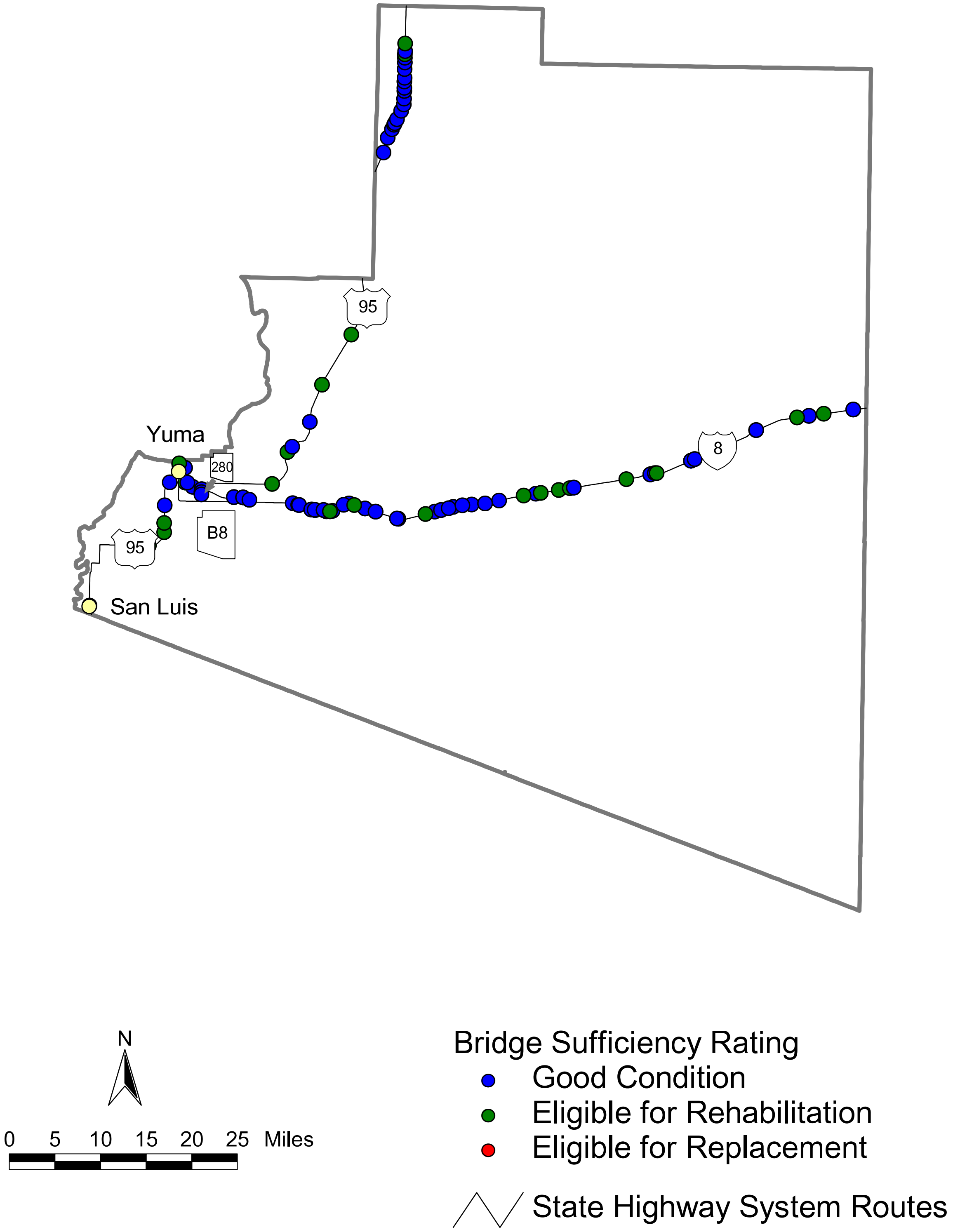
BRIDGE SUFFICIENCY RATING IN SANTA CRUZ COUNTY


19
83
82
289
Nogales
N
0
5
10
15
20
Miles
Bridge Sufficiency Rating
Good Condition
Eligible for Rehabilitation
Eligible for Replacement
State Highway System Routes

BRIDGE SUFFICIENCY RATING IN YAVAPAI COUNTY



BRIDGE SUFFICIENCY RATING IN YUMA COUNTY

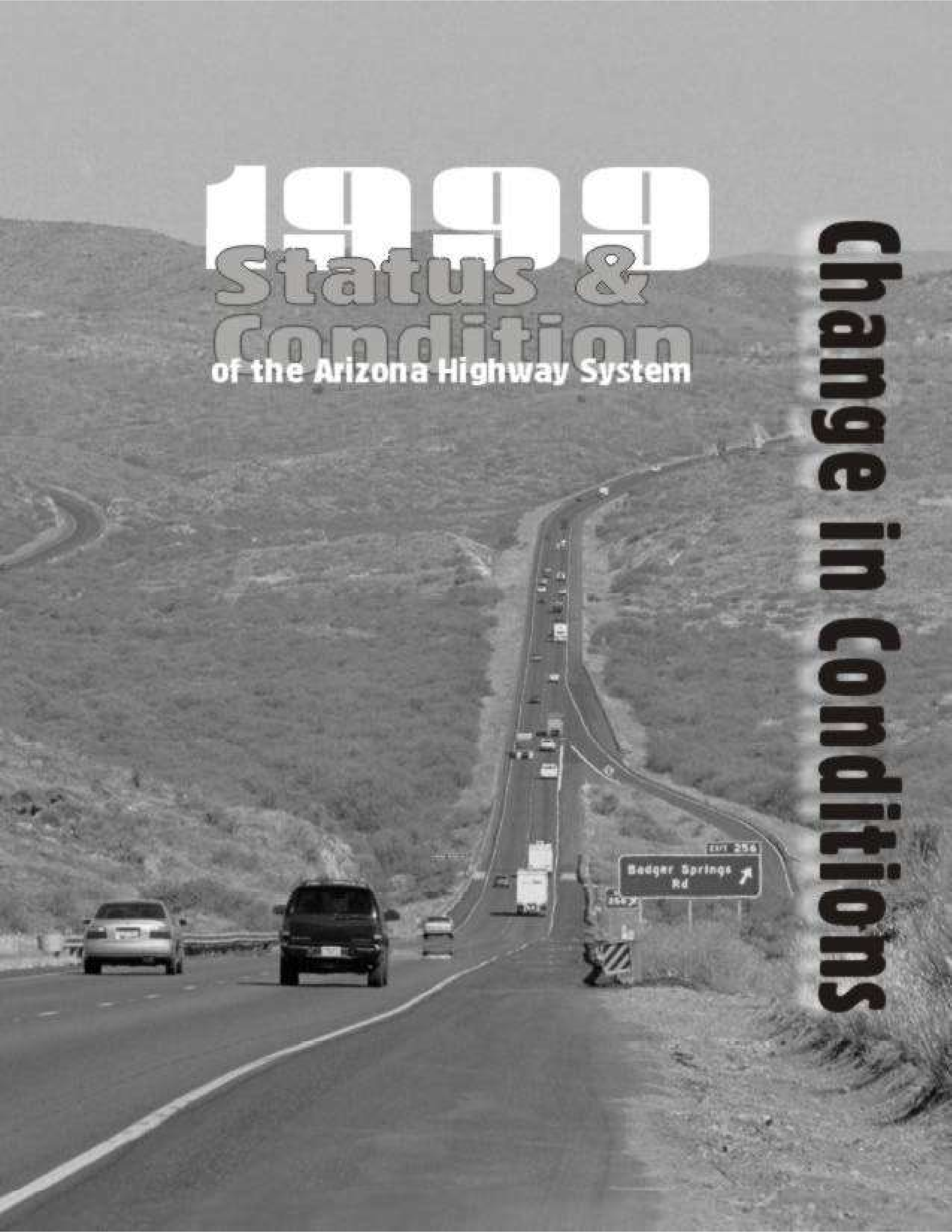

95
Yuma
280
8
B8
95
San Luis
N
0 5 10 15 20 25 Miles
Bridge Sufficiency Rating
● Good Condition
● Eligible for Rehabilitation
● Eligible for Replacement
State Highway System Routes

1999

Status & Condition

of the Arizona Highway System

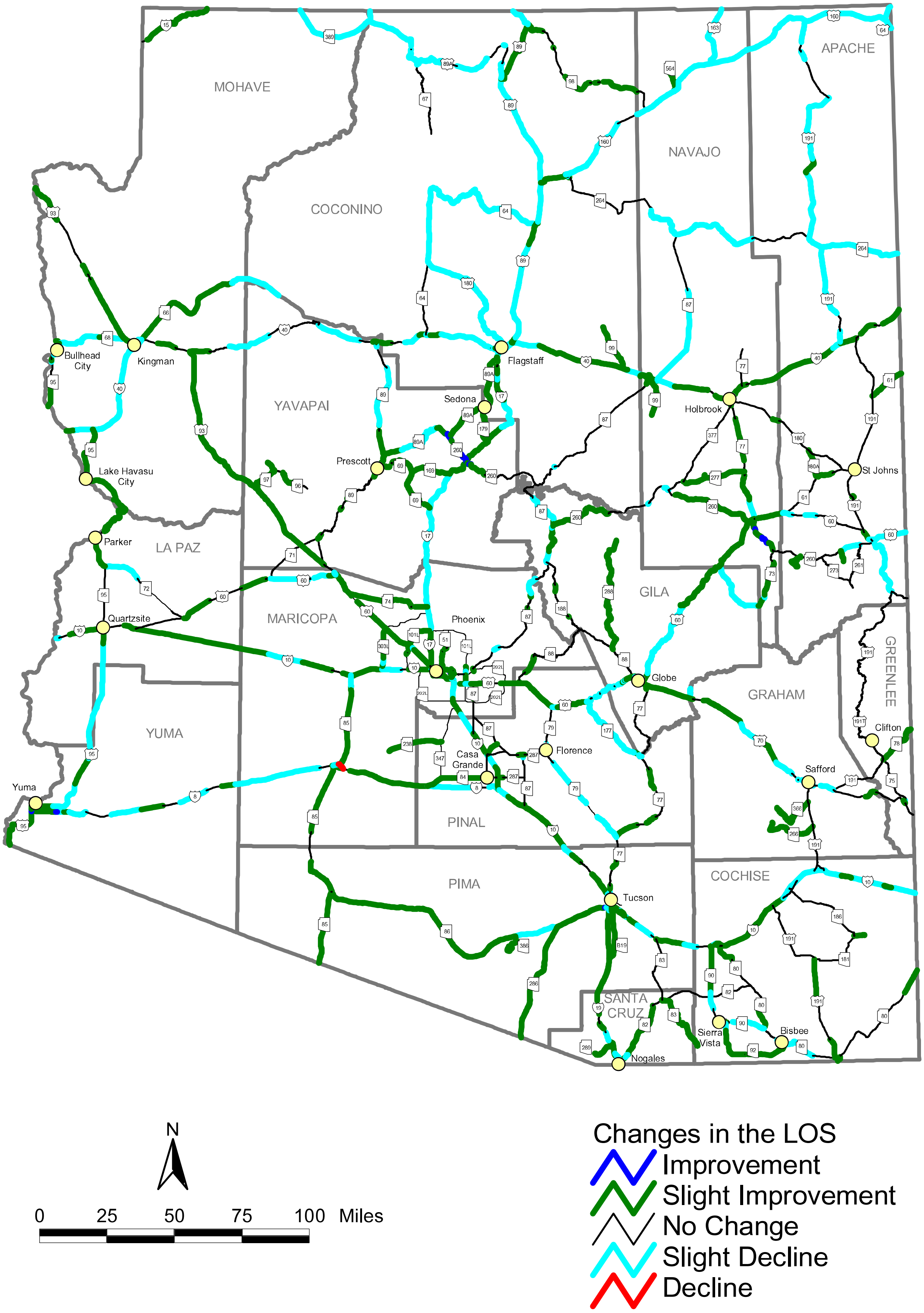
Change in Conditions

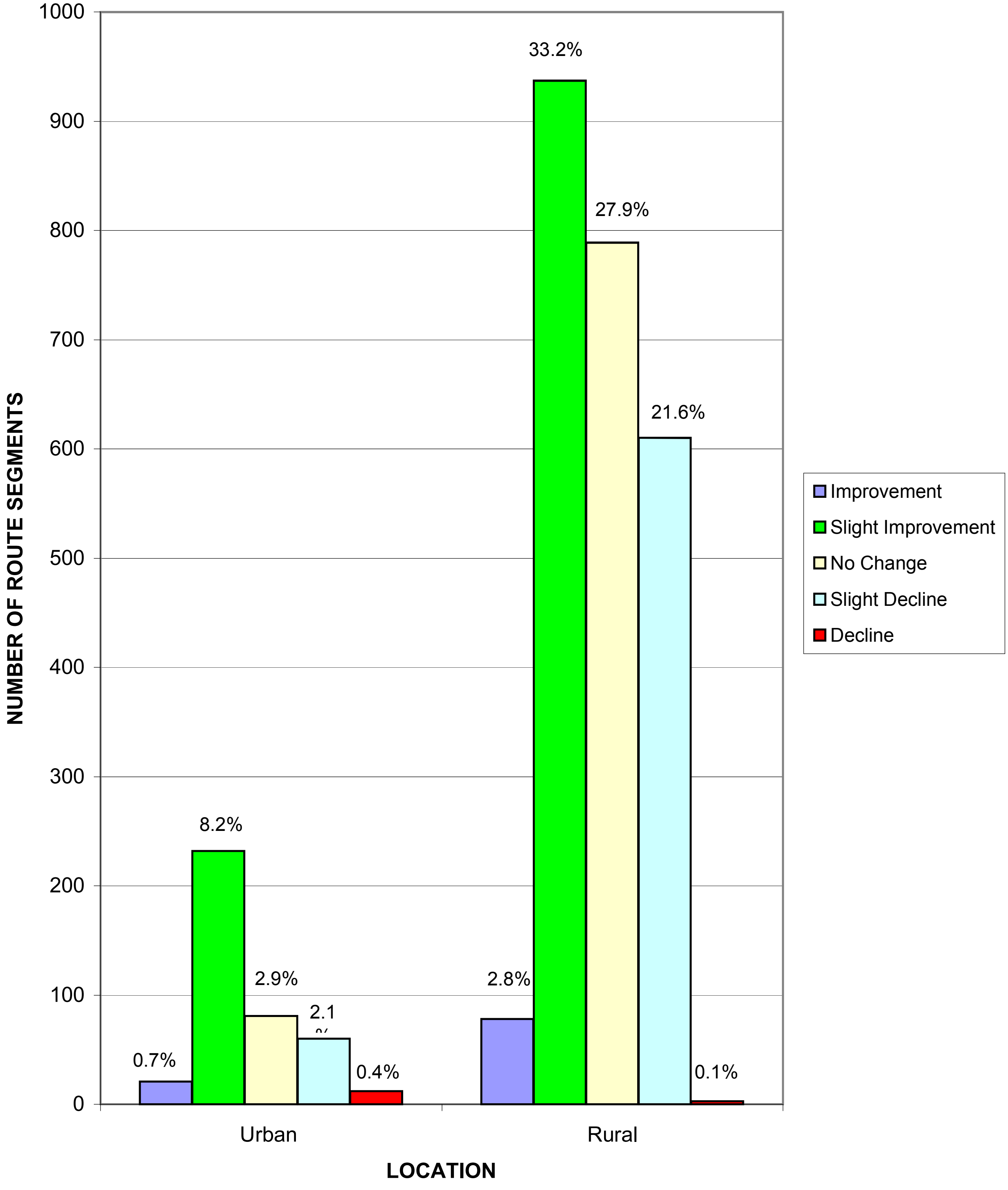


Change in Condition

The following two maps show the difference in Level of Service (LOS) and Present Serviceabilty Rating (PSR) in the 1999 Highway Status and Condition Report compared to the 1998 report. The Bridge Condition Index changes are not displayed because it is extremely difficult to present at the state level. We have included two bar charts that depict the percentage change in the LOS and PSR. The percentage is the portion of the State Highway System that improved, declined, or remained the same. A change in the in LOS in the range of 0.001 to 0.24 was considered a slight change. A change of greater than 0.25 was considered as significant. For the PSR a change of less than 0.49 was considered slight and a change greater than 0.50 was considered significant.

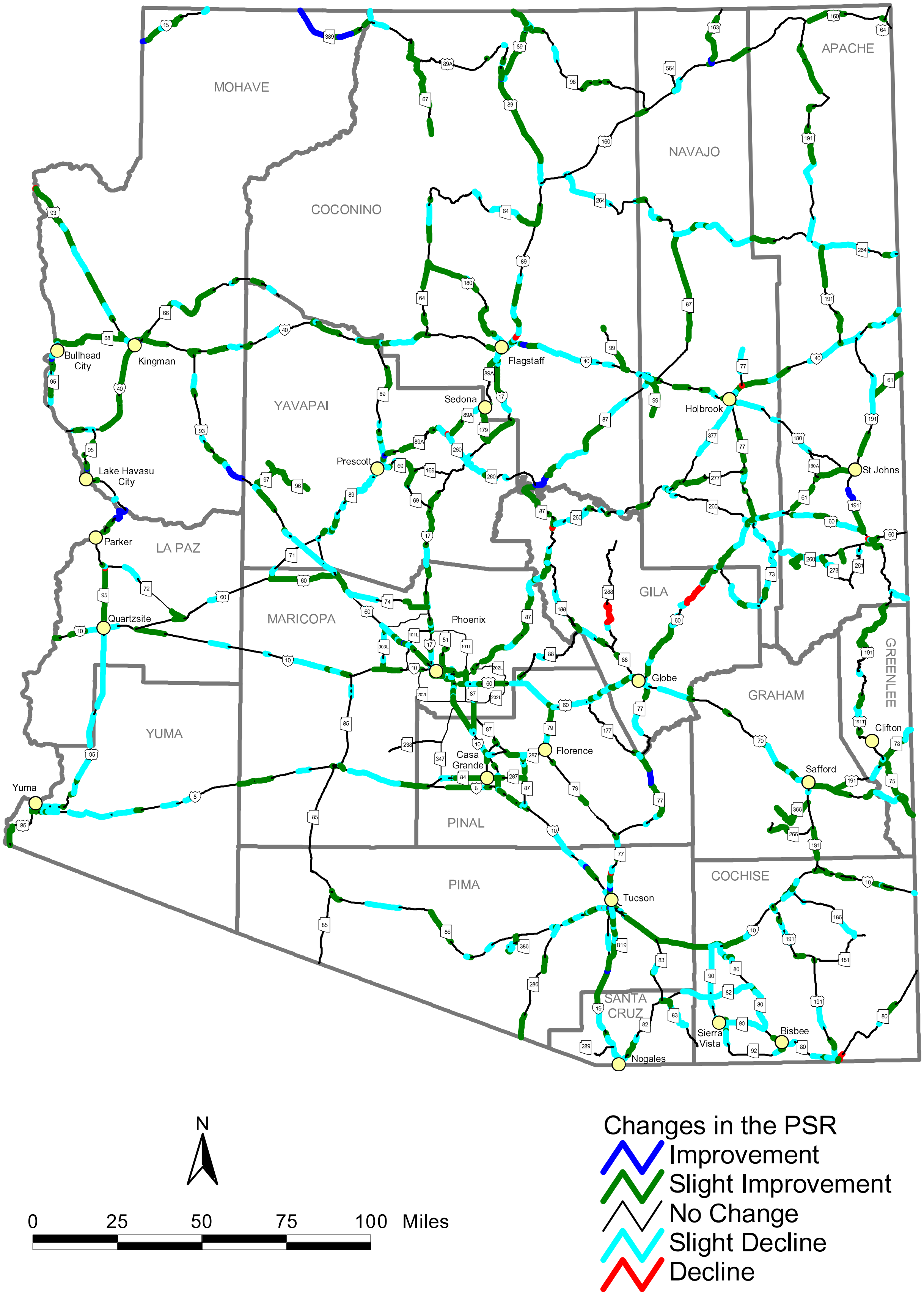
1997-98 CHANGES IN THE LEVEL OF SERVICE ON THE STATE HIGHWAY SYSTEM





CHANGES IN LOS BETWEEN 1998 & 1999

1997-98 CHANGES IN THE PRESENT SERVICEABILITY RATING ON THE STATE HIGHWAY SYSTEM



CHANGES IN PSR BETWEEN 1998 & 1999